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ABSTRACT

The purpose of this study was to investigate whether high school subject matter text which was revised on the basis of secondary school students' oral reading miscues that result in grammatical re-transformations had greater readability than the original text. The subjects, 217 students, were randomly selected and were assigned to stanine levels based on the results of the comprehension part of the Diagnostic Reading Test, Survey Section, Upper Level, Form B. A stratified subsample of 23 subjects was then selected to orally read the subject matter passages. The readings were tape recorded. The miscues were transcribed onto worksheets and analyzed according to the procedures of the Reading Miscue Inventory. An additional group of 96 ninth graders matched to the descriptive phase sample on Diagnostic Reading Test scores were randomly assigned to take one of the readability tests. Some of the conclusions indicated that (1) the oral reading of the students demonstrated that they attempted to read just the syntactical patterns of the subject matter passages in order to gain meaning and (2) the analysis of miscues revealed portions which were confusing and/or ambiguous. (Author/WR)

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Final Report

Project No. I-B-025
Grant No. OEG 2-71-0025

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READABILITY OF HIGH SCHOOL TEXT PASSAGES BEFORE AND AFTER REVISION

January 1973

U.S. Department of Health, Education, and Welfare
Office of Education
National Center for Educational Research and Development
(Regional Research Program)

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Chapter 1

INTRODUCTION

Reading specialists at the secondary level usually are concerned with how to effect improved reading in the subject matter areas. Unlike the situation in the elementary schools, there frequently are no specific instructional periods in developmental reading which are an integral part of secondary school curricula. In order to bring reading instruction into close association with the content areas, Robinson and Thomas[1], Shepherd[2], Dawson[3], and Strang, McCullough and Traxler[4] demonstrated the importance of preparing students to read effectively in the different content subject areas. Herber and Sanders[5] reported a concerted effort to study reading improvement in the secondary schools.

The major reasons for the reading specialist to be concerned with effective reading in the subject matter areas are the central place of the textbook in content area instruction and the frequent inability of content area teachers to handle the reading demands of their subjects. According to Courtney[6], the results of interviews with special reading personnel showed that they felt reading in content areas was characterized by a lack of awareness on the part of the content teachers of the reading demands of their own subjects.

The present study is an attempt to analyze some of the difficulties students encounter in reading subject matter materials. An analyis of the reading difficulties secondary school subject matter materials appear to present to students may provide information for restructuring or rewriting the materials so they will be easier for students to read. The study also attempts to measure the effectiveness of the material, or the ease of readability of the material because of the way it is written, against some characteristics of the students.

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[1] H. Alan Robinson and Ellen Thomas (Eds.), Fusing Reading Skills and Content (Newark, Del.: IRA, 1969).

[2] David L. Shepherd, Effective Reading in Science (Evanston, Ill.: Harper & Row, 1960).

[3] Mildred Dawson (Ed.), Developing High School Reading Programs (Newark, Del.: IRA, 1967).

[4] Ruth Strang, Constance M. McCullough and Arthur E. Traxler, The Improvement of Reading, 4th ed., (New York: McGraw-Hill, 1967).

[5] Harold L. Herber and Peter L. Sanders (Eds.), Research in Reading in the Content Area, First Year Report (Syracuse: Reading & Language Arts Center, 1969).

[6] Bro. Leonard Courtney, "Meeting Special Reading Needs in the Content Area," in Robinson and Thomas, pp. 26-36.

CONCEPTUAL BACKGROUND

This study is based on the assumption that reading is a psycholinguistic process[7]--that it is an interaction between the reader and the written language, in which the reader tries to reconstruct the writer's meaning. The theory of reading as a psycholinguistic process, in turn, is based upon a generative-transformational theory of grammar in which it is hypothesized that ideas can be presented in more than one syntactical pattern.[8]

Transformational Grammar

Generative-transformational grammarians make the assumption that spoken statements can be reiterated with different grammatical structures, that is, in different syntactical patterns, and still contain the same, or nearly the same, concepts. Grammar is a system of three components: (1) the syntactic, (2) the semantic, and (3) the phonological. When the grammarians are providing information about written languages (a dialect of spoken language), the last component becomes "grapho-phonological." For every generated, or produced, sentence there is a deep structure (the basic underlying meaning of the sentence) which determines its semantic interpretation. The surface structure (the form of the sentence either spoken--phonological component--or written--graphological component) is arrived at by repeated applications of certain formal operations called "grammatical transformations." Those sentences which have not undergone a transformation and which have a surface structure identical to their deep structure are called kernel sentences.[9]

The syntactic component contains two sub-components: (1) the deep structure generator, and (2) the transformation rules. The deep structure contains a definition of the system of grammatical relationships, and determines the ordering of the elements. It also contains a denotative lexicon. The transformation sub-component determines which of alternative, equally acceptable, rules will be employed to arrive at the surface structure.

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[7] Kenneth S. Goodman, "Reading: A Psycholinguistic Guessing Game," J. of the Reading Specialist, VI (May, 1967), pp. 126-35; see also Kenneth S. Goodman, "The Psycholinguistic Nature of the Reading Process," The Psycholinguistic Nature of the Reading Process, ed. K. S. Goodman (Detroit: Wayne State U., 1969), pp. 15-26; and Kenneth S. Goodman, "Analysis of Oral Reading Miscues," Reading Research Quarterly, V (Fall, 1969), pp. 9-30.

[8] Noam Chomsky, Aspects of the Theory of Syntax (Cambridge, Mass.: MIT Press, 1956).

[9] Chomsky, pp. 1-65.

The semantic component then supplies the connotative aspects of language. Finally the grapho/phonological component determines what sounds, or graphic representations, will be given to the sentence. At all times, though, there is a constant feedback and/or interaction among all components and sub-components.[10]

The transformational grammarians begin with the sentence and its variations and attempt to determine how the forms and sounds of words are determined by the larger patterns in which they are placed. The analysis of words and sounds are included in the analysis of sentences. The linguistic descriptions provided by the transformational gramarians is not an account of actual speech behavior, but rather a description of the possible sentences which might be produced.

Psycholinguistic Theory of Reading

The theory of reading as a psycholinguistic process postulates that the reader, as a user of language and in response to the graphic display on the page, processes three kinds of information: (1) graphophonic, (2) syntactic, and (3) semantic. Reading becomes a selection of, and partial use of, the available language cues from a perceptual input based on the reader's expectations. The reader then makes tentative decisions which are confirmed, rejected, or revised as reading progresses.[11]

The assumption is made that the reader's accuracy in processing the language cues may be demonstrated through oral reading which shows no deviation from the printed page. When deviations occur between the reader's oral response and what was expected, the phenomena are called "miscues."[12]

Goodman described the reading act as a generally sequential process occurring in the following manner:

1. The reader scans along a line of print from left to right and down the page, line by line.
2. He fixes at a point to permit eye focus. Some print will be central and in focus, some will be peripheral; perhaps his perceptual field is a flattened circle.
3. Now begins the selection process. He picks up graphic cues, guided by constraints set up through prior choices, his language knowledge, his cognitive styles, and strategies he has learned.
4. He forms a perceptual image using these cues and his anticipated cues. This image then is partly what he expected to see.

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[10]Chomsky, pp. 1-65.

[11]Goodman, "Reading," pp. 126-35.

[12]Kenneth S. Goodman, "A Linguistic Study of Cues and Miscues in Reading," Elementary English, XLII (October, 1965). pp. 639-43.

5. Now he searches his memory for related syntactic, semantic, and phonological cues. This may lead to selection of more graphic cues and to reforming the perceptual image.
6. At this point, he makes a guess or tentative choice consistent with graphic cues. Semantic analysis leads to partial understanding as far as possible. This meaning is stored in medium-term memory as he proceeds.
7. If no guess is possible, he checks the recalled perceptual input and tries again. If a guess is still not possible, he takes another look at the text to gather more graphic cues.
8. If he can make a meaningful choice, he tests it for semantic and grammatical acceptability in the context developed by prior choices and understandings.
9. If the tentative choice is not acceptable semantically or syntactically, then he regresses, scanning from right to left along the line and up the page to locate a point of semantic or syntactic inconsistency. When such a point is found, he starts over at that point. If no inconsistency can be identified, he reads on seeking some cue which will make it possible to reconcile the anomalous situation.
10. If the choice is acceptable, understanding is extended, meaning is assimilated with prior meaning, and prior meaning is accommodated, if necessary. Expectations are formed about input and meaning that lies ahead.
11. Then the cycle continues.[13]

Grammatical Re-transformations

Goodman and Burke examined oral reading mis-cues which resulted in grammatical re-transformations.[14] (Re-transformations are any changes in grammatical structure which occur to a textual sequence during oral reading. Re-transformations have a relationship to the concept of transformations. A reader may re-transform the text sequence during oral reading because: (1) he infers a different deep structure from the author's; (2) he infers the same deep structure as the author but uses a different set of transformations to attain the surface structure; or (3) he infers the same deep structure as the author but uses an alternate available set of transformations to attain the surface structure. A different set of transformations may be used when the reader uses a different dialect of the language than the author, whereas users of the

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[13]Kenneth S. Goodman, "A Flow Chart of Goodman's Model of Reading," Theoretical Models and Processes of Reading, eds. H. Singer and R. Ruddell (Newark, Del.: IRA, 1970), p. 272

[14]Kenneth S. Goodman and Carolyn Burke, Study of Oral Reading Miscues that Result in Grammatical Retransformations, Final Report, Project #425, Contract #OE-610-136 (Washington, D.C.: U.S. Office of Education, 1969).

same dialect may use alternate transformations.)

Qualitative differences with re-transformation mis-cues showed that these mis-cues occurred at pivotal points in language structure. The investigators speculated about the predictative power the use of such categories might provide. They concluded that there is an obvious need for research into the structural relationships between sentences, density of concepts, and ambiguity, and that the use of transformational grammar concepts offers a new approach to speculating about readability and text complexity.

STATEMENT OF THE PROBLEM

The purpose of this study is to investigate whether high school subject matter text, revised on the basis of secondary school students' oral reading mis-cues that result in grammatical re-transformations, has greater readability than the original text for secondary school students.

Questions

The questions raised by studying the readability of specific subject matter text in relation to secondary school students' reading needs are:

1. Would subject matter passages read orally by secondary school students result in mis-cue patterns which would reveal difficult or ambiguous syntactical and semantic structures?
2. Would such subject matter passages have a greater ease of readability if they were revised to conform more to the students' syntactical and semantic expectations?

Significance

The significance of the present study is the knowledge added to: (1) the nature of the reading process, (2) the concept of readability, and (3) the preparation of instructional materials.

Much of the previous research into the psycholinguistic nature of the reading process was conducted with elementary school pupils. Little research has been conducted on the mis-cues of secondary school pupils. The present study adds to the understanding of mis-cues in older pupils and to the understanding of mis-cues in subject matter areas. This information should be useful for helping to refine the concept of the reading process and seeking out developmental patterns which may exist in the nature of mis-cues.

Information from this study adds to the existing body of knowledge about readability. More recent investigations into readability have not been only concerned with determining which materials are more difficult to read when compared with each other, but have attempted to

discover the cause of reading difficulty within and between materials. The mere use of indices of familiar words and sentence length have not been adequate, so investigators have sought for psycholinguistic factors, that is, factors which contain relationships between thought processes and language, which would account for the difficulty level of the reading material. The present study, by analyzing secondary students' mis-cues in subject matter material and measuring the readability of revised material based upon those mis-cues, adds to the understanding of what might make specific ideas more readable because of the way they are written.

Hypothesis

The mean readability scores for the revised passages will be significantly higher than the mean readability scores for the original passages.

Chapter 2

BACKGROUND OF THE PROBLEM

The problem necessitated a review of the literature concerned with two areas of research. The first is that aspect of readability measurement in which the readability of different versions of the same material is measured by the degree to which the content of the material is understood. In the past, this research has been known as "experimental validity studies of readability formulas" because the validity of the formulas, that is, the ability of the formulas to predict easier reading material, was being tested. Recently, this research has been labeled "horizontal readability" because other linguistic controls over readability than just those used in formulas are being used.

The second area of research is oral reading mis-cues.

HORIZONTAL READABILITY

These studies are reviewed in two groups. The first group consists of studies in which revisions of the text were applications of the principles underlying existing readability formulas; alternate forms were created by substituting vocabulary, adjusting sentence length, averaging syllabic-word length, or apply combinations of these. The second group consists of studies in which the revisions were based upon some other features of language, notably control of style, syntactical patterns, and grammatical transformations.

To provide consistency in reporting the studies, a uniform method is maintained for discussing readability and comprehension. Some investigators "increased" the readability and some "lowered" the readability level, yet all meant the same thing. Therefore, studies are reported as a high level or low level of difficulty, as measured by a readability formula. "Comprehension," "understanding," and "effectiveness" were terms applied to the same concept--the amount of information assumed gained by the subjects from reading a particular passage. Here, for uniformity of reporting, the term "comprehension" is used. Where it is necessary to deviate from this procedure, an explanation is provided.

Revisions by the Principles of Readability Formulas

The readability formulas most often used in this group of studies were the Dale-Chall "Formula for Predicting Readability," and the Flesch formulas of reading ease. The former uses indexes of sentence length and unfamiliar words,[1] whereas two of the latter formulas are based upon

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[1]Edgar Dale & Jeanne S. Chall, "A Formula for Predicting Readability," Educational Research Bulletin, XXVIII (January, 1948). pp. 11-20 and 37-54.

scores of average sentence length, average syllabic word length, and human interest measured by a ratio between the number of personal nouns and pronouns and the number of sentences of a conversational quality).[2] A third Flesch formula measures readability in terms of the ratio between the number of abstract and concrete words (from an arbitrary list of "definite" words).[3]

Vocabulary. In three related studies, the investigators tried to determine the effect of vocabulary changes on children's reading comprehension of social studies material by having all unfamiliar words except proper nouns replaced with words found on the International Kindergarten Union list of 2500 words. Comprehension tests were given for both the original and simplified versions. Forster[4] found that although the simplified versions were read faster, comprehension was not always helped by the simplification technique. Kuenenman[5] found no significant difference between comprehension tests on the original and simplified versions. Clarke,[6] however, found a slight but consistent indication that simplified vocabulary tended to make for better and quicker comprehension of the material. The three reports gave no indication of how comprehension was measured, or what statistical procedures were employed.

In a more thorough analysis, Nolte[7] gave evidence of the negligible effect on comprehension of simplified vocabulary. Three selections from a standardized test were each rewritten twice. One alternate version used words found in Ogden's System of Basic English and the other used words in the 2,500 found most common on the Thorndike list. The results showed no significant differences in comprehension scores of students in grades six to eight for the simplified versions when compared to the original and to each other.

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[2]Rudolph Flesch, "A New Readability Yardstick," J. of Applied Psych., XXXII (June, 1948), 221-232.

[3]Rudolph Flesch, "Measuring the Level of Abstraction," J. of Applied Psych., XXXIV (December, 1950), 384-390.

[4]Charlotte Foster, "The Effect upon Reading Comprehension of Paraphrasing Elementary Historical Material into Spoken and Written Vocabulary of Children" (Unpublished Master's thesis, State U. of Iowa, 1931).

[5]Huberteen Kuenenman, "A Study of the Effect of Vocabulary Changes on Reading Comprehension in a Single Field" (Unpublished Master's thesis, State U. of Iowa, 1931).

[6]Lois Clarke, "The Effect on Comprehension of Simplification of Social Studies Reading Material in a Second Grade" (Unpublished Master's thesis, State U. of Iowa, 1933).

[7]Karl Nolte, "Simplification of Vocabulary and Comprehension in Reading," Elementary English Review, XV (April, 1937), 199-24, 146.

Robinson[8] studied how reading comprehension was affected by the complexity of vocabulary. Two legal documents, one dealing with law, the other with insurance, were brought to a lower level of difficulty by substituting familiar words (i.e., words, appearing on the Thorndike List) for synonyms which did not appear on the test. On each of the four passages (two original and two simplified), questions were used to test college students' comprehension of the total idea of each passage. The effects of prior training in either insurance or law were tested, as well as intelligence. Results demonstrated that subjects who had high intelligence or specific training in insurance or law scored consistently but not significantly higher on comprehension measures. Of the two variables, specific training and intelligence, specific training had the greater effect on comprehension scores.

In a study using the Flesch formulas for the control of only vocabulary difficulty, Ludwig[9] compared the readership of two sets of articles in a farm journal. One set differed in the average syllabic word length, and the other, in the Flesch human interest count. He found that the easier article (lower syllabic word count) had a higher readership although the difference was significant at only the .10 level. Analysis of the articles differing in human interest showed that readership scores were not significantly different.

Also using what appeared to be the Flesch formulas for vocabulary control, Klare, Mabry, and Gustafson[10] gave a different version of a two-part lesson on aircraft mechanics to each of four groups. The versions differed in the level of human interest used in the two halves. The results showed that although a high level of human interest in technical writing resulted in a greater amount of material to be read within a given time, no significant difference was produced in immediate retention (comprehension) test scores, and the high level of human interest was less acceptable to readers.

Ayer[11] used fifth to eighth grade children's misinterpretations of difficult history words and expressions as an aid in writing the

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[8]Francis P. Robinson, "The Effect of Language Style on Reading Performance," J. of Educational Psych. XXXVIII (March, 1947), 149-56.

[9]M. Ludwig, "Hard Words and Human Interest: Their Effect upon Readership," Journalism Quarterly, XXIV (June, 1949), 167-71.

[10]George R. Klare, J. E. Mabry, and L. M. Gustafson, "The Relationship of Style Difficulty to Immediate Retention and to Acceptability of Technical Material," J. of Educational Psych., XLVI (May, 1955), 287-95.

[11]Adelaide Ayer, Some Difficulties in Elementary School History, Contributions to Education, No. 212 (N.Y.: Teacher's College, Columbia U., 1926).

false statements of a true-false, multiple-choice type test which was given to fifth and seventh graders in two forms. One had the original paragraphs, and the other had the same paragraphs simplified in light of the children's misinterpretations. A child with normal fifth grade reading comprehension answered correctly 12 percent of the questions based on the original paragraphs whereas the child could answer 26 percent of the questions based on the simplified paragraphs. A similar relationship existed for a student with seventh grade reading ability. The results demonstrated the inability of fifth and seventh graders to comprehend fifth grade history paragraphs. Comprehension appeared to be blocked to a great extent by difficulties unessential to history, especially figurative language and abstract words.

Hampton[12] explored a procedure for overcoming the language difficulties of a personality inventory so that it would be usable with adults of limited education. The test, originally a test to be read silently and group administered, was given individually to a group of retail grocers chosen randomly from a Canadian city. As each took the test, he was encouraged to ask the meaning of any word he did not understand. Then, using a thesaurus, the investigator substituted a synonym for each word and phrase which was not understood, revised the inventory, and administered it to a random selection from the same population. In this second testing, a smaller number of words were not understood and the revision procedure was again undertaken. No statistical results were obtained because the intention was only to suggest a way for revising such an instrument even though the original meaning may have been disturbed.

The investigators who used word lists or formulas for controlling vocabulary difficulty found no significant differences in the performance of the subjects between their original and altered versions. The technique employed by Ayer and Hampton, of using some of their subjects' misconceptions as the criterion for substituting vocabulary, seems to be a useful alternative to the use of vocabulary lists.

Sentence length. Orndorff[13] investigated the effect of sentence length upon comprehension. Selected articles and revisions in which the sentences were shortened were given to elementary school students. The results indicated that there was no significant difference between the comprehension scores on the versions with long or short sentences.

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[12] P. Hampton, "Language Difficulties of the Bernreuter Personality Inventory," J. of Educational Psych., XXXII (September, 1941), 471-73.

[13] B. A. Orndorff, "An Experiment to Show the Effect of Sentence Length upon Comprehension" (Unpublished Master's thesis, State U. of Iowa, 1925).

Holland[14] studied both the effect of length and structure of sentences on the silent reading process. Two forms of 10 selections dealing with geography prose and differing in sentence complexity (compound, complex, and simple) as well as sentence length were created and given to students at the elementary, junior high school, and college freshman levels. All subjects, reading all the selections silently in two sittings a month apart, were measured with an eye-movement camera and a comprehension test. The results indicated that the effect of sentence length and structure on comprehension varied with different sentence patterns, different individuals, and with different groups of subjects.

Coleman[15] studied the effect upon comprehension of shortened sentences. Three difficult passages from a college textbook were matched with slight alterations for number of words, syllables, prepositions, direct words, and sentences. Then each passage was rewritten in two other versions, one containing fewer sentences, the other a greater number. Readability was considered the same as comprehension and was measured by cloze tests. The results indicated that the shortened sentences were significantly more readable than the original or long sentence versions, but there was no difference between the original or long versions. Further analysis of each sentence in all versions indicated that dividing long sentences was significantly more effective than dividing short ones.

This study raised more questions than it answered. The investigator noted that comprehension might be improved if subordinate clauses were raised to full sentences, if sentences joined by conjunctions were divided, and if clauses were shortened rather than made into separate sentences, but, he noted, comprehension might not be improved if sentences joined by "and" were divided.

Whole readability formulas. Using a Flesch formula, Murphy[16] studied the effect easier reading material had on increasing the readership of two farm journals. Four articles and their rewritten forms were alternated in the two journals with the size of the type, illustrations, leads, subject matter, and position of the articles kept the same. The factors put to use for producing less difficult material were substitution of words to reduce the number of syllables per hundred words, and shortening sentences. Reporters were sent out to interview subscribers selected at random. The results demonstrated that three of the articles showed an increase in the number of readers for the rewritten versions. The one article which showed a decrease was an editorial.

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[14]B. F. Holland, "The Effect of Length and Structure of Sentences on the Silent Reading Process," Psychological Bulletin, XXX (November, 1933), 668-69.

[15]Edward B. Coleman, "Improving Comprehensibility by Shortening Sentences, J. of Applied Psych., XLVI (April, 1962), 131-34.

[16]D. R. Murphy, "How Plain Talk Increases Readership 45% to 66%." Printer's Ink, (September, 1947), 35.

Also using a Flesch formula, Marshall[17] studied the relationship between readability and comprehension of high school physics texts. Two groups of high school students, equated on measures of reading comprehension and physics aptitude, read two versions of a standard physics text. The original version was written at the thirteenth grade level while the rewritten, differing only in sentence length and syllabic word length, was written at a ninth grade level. The results showed that those who read the rewritten version did not do better on a test of comprehension, that good readers did better regardless of which passage was read, and that good physics students did better regardless of which passage was read. The conclusion was drawn that the particular readability formula used did not predict differences in comprehension and that its use to assess the readability of a physics textbook was unjustifiable.

Swanson[18] attempted to determine whether a long article made easier to read by applying principles, which seemed to be those of a Flesch reading ease formula, won and held more readers. A split-run technique was used in a campus newspaper to report two campus surveys not reported elsewhere. The two versions of the article, one written on a thirteenth grade level and the other on a sixth grade level, differed in the level of difficulty according to five formulas (unnamed by the investigator). The major variable used to adjust the difficulty level of the versions was syllabic word length. The results showed that a less difficult article makes for a readership of a significantly larger number of paragraphs.

Using both the Flesch and the Dale-Chall formulas, Swanson and Fox[19] studied the effects of easy and hard versions of 12 articles in a house organ on the retention, readership, and comprehension of a group of employees. According to the two readability formulas used in combination, the articles differed in overall score, number of words, human interest, sentence length, syllabic word length, the number of unfamiliar words, and the number of verbs and adjectives. Three judges determined that the information content of both versions was the same. The results indicated that there was no significant difference between sample groups, which were equated on factors of social, intellectual, and employment characteristics, on the retention tests, or in readership. Those reading the less difficult material, though, did score significantly better on the comprehension test.

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[17]J. Stanley Marshall, "Comprehension and Alleged Readability of High School Physics Textbooks," Science Education, XLVI (October, 1962), 335-46.

[18]Charles E. Swanson, "Readability and Readership: A Controlled Experiment," Journalism Quarterly, XXV (December, 1948), 339-43.

[19]Charles E. Swanson & Harland G. Fox, "Validity of Readability Formulas," J. of Applied Psych., XXXVII (April, 1953). 114-118.

Klare, Shuford, and Nichols[20] used the Flesch formulas for reading ease and abstractness and the Dale-Chall formula when they studied the learning and retention of technical material about engine mechanics as related to the variables of style difficulty of the passages, amount of practice, and ability of the subjects. Two versions of the test passages were created by varying the percentage of short, familiar, frequently used words, the average sentence length, and the proportion of concrete to abstract wordings. Two groups differing in mechanical ability read alternate versions of the passages before an eye-movement camera. Results demonstrated that the easy style produced significantly higher scores on the words read per fixation, words read per second, and recall tests. Increasing the number of readings (practice) resulted in significant increases in words read per second, recall, and word recognition scores. Those with higher mechanical ability received significantly higher scores on all dependent measures.

Drake[21] used the Dale-Chall formula alone to create alternate versions. His purpose was to study the effectiveness of the readability formula in predicting success on technical and non-technical reading materials of secondary school students. Two versions of each type of material were written, one at tenth grade level, one at fifth. Objective comprehension tests were constructed for each type of material which were used as pre-tests, post-tests, and, later, as tests of retention by selected seventh grade students matched on sex, reading ability, scholastic aptitude, and pre-test scores. The results indicated that rewriting technical and non-technical content to a lower level of difficulty did not significantly improve the learner's comprehension, but that learners understood and recalled facts and concepts from non-technical content more easily.

Williams[22] used the Yoakam Readability Formula in studying the effect of rewriting a textbook passage on the comprehension of sixth grade students. A selection from a science text, tested by the formula to be at sixth grade level, was rewritten to third grade level, but all words which appeared in a standard handbook of technical vocabulary were retained in the rewritten version. Williams simplified the retained technical vocabulary by substitution, amplified it by addition of phrases

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[20]George R. Klare, Emir H. Shuford & William H. Nichols, "The Relationship of Style Difficulty, Practice and Ability to Efficiency of Reading and Retention." J. of Applied Psych., XLI (August, 1957). 222-26.

[21]Lawrence C. Drake, "The Effectiveness of a Selected Readability Formula in the Prediction of Student Success with Technical and Non-Technical Materials," Dissertation Abstracts, XXVII (1967), 2937.

[22]D. L. Williams, "Rewritten Science Materials and Reading Comprehension," J. of Educational Research, LXI (January, 1968), 204.

or sentences, and rephrased and shortened sentences. Each passage was divided into three reading assignments and then each subject was given a multiple response test, constructed from the original passage and testing factual recall, main ideas, and inference. The results indicated that the rewritten text helped all students read at a faster rate and with better comprehension, and that the comprehension scores of the subjects with above-average reading ability were better than those of subjects with average reading ability over both versions of the passage.

Laubach[23] investigated ways of communicating (transferring meaning from one person to another) with adults of limited reading ability by specially written materials. He hypothesized that adults with less than five years of schooling could receive communications through specially written materials and that those materials could be prepared in various ways which would differ in difficulty level. All the adults were part of adult elementary reading classes in two large cities. The classes in one city were composed predominately of foreign born for whom English was a second language, and those in the other city consisted generally of native born English-speaking blacks. Four articles from a daily newspaper were each rewritten in three ways. The first was made less difficult based on the investigator's experience and on prevailing readability theory; the second was based upon the speech patterns taught in the Fries-Lado program for teaching English as a second language; and a third revision was created by reducing in number the variety of patterns and verb tenses used to create the second revision. The reading level of the original articles, according to the Dale-Chall formula, was ninth grade level, while each of the revised articles, as measured by the Spache formula (an index using the same principles as the Dale-Chall), was second grade level. A single 10-item multiple-choice comprehension test was developed for each selection. The results showed that there was a significant difference, favoring the revised forms as a group, between the comprehension scores on the original article and scores on the revised articles, but there was no difference among the scores of the three revised articles.

Hayes[24] investigated the relationship of the socio-economic status of pupils to the comprehension of reference materials written at different levels of difficulty. High school freshmen in vocational education courses read an agricultural service unit which had been tested with a readability formula (name not cited), and then rewritten to a lower difficulty level. The subjects, classified into socio-economic classes, were randomly assigned to read either an original or

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[23]Robert S. Laubach, "A Study of Communications to Adults of Limited Reading Ability by Specially Written Materials". (Unpublished Doctor's dissertation, Syracuse U., 1963).

[24]Glenn W. Hayes, "The Relationship of Socio-economic Status of Pupils to their Comprehension of Reference Materials Written at Different Levels of Readability," Dissertation Abstracts, XXVII (1966), 3773.

revised form, were given a standardized reading test, and then a criterion test of multiple-choice items. This test measured both recall comprehension and application of ideas. The results showed no significant differences in scores among the socio-economic groups on the standardized reading test, the application portion of the criterion test, or between those who read different versions of the material. There was a difference on the recall measure significantly in favor of those who read the rewritten version.

Blue[25] investigated the influence on science reading comprehension of differences in vocabulary difficulty, sentence length, and style of writing. Eight versions of a science article were created to cover the following variables in cross combinations: (1) four versions in expository and four in narrative style; (2) four at seventh grade level and four at eleventh grade level as measured by the Dale-Chall readability formula; and (3) four versions which contained explanations of selected technical terms through the use of context clues, appositives, and restricted clauses, and four that did not contain the explanations. The seventh grade subjects were randomly assigned to one of the treatment groups, but all took the same 25-item comprehension test and completed a rating scale to measure personal reactions to the style of the material. The results showed no differences among the stylistic variables and no relationship between reading achievement and comprehension or science achievement and comprehension.

Revisions by Other Language Features

Researchers have not universally accepted the fact that a simple count of familiar words and word or sentence length is enough to account for the differences in readability between two versions of the same content. Stylistic, organizational, and grammatical differences have been investigated in attempts to pinpoint which language features could be used to make material more readable. The results in this group of studies are somewhat more decisive than those in the preceding one.

Stylistic changes. Stylistic changes which were used to create alternate forms included the use of a conversational approach, material in digested or amplified form, various sentence complexities, and a variety of organizational patterns. Although none of this research was conclusive, there was some indication that material in which difficult ideas were explained more fully, or which was organized more logically and to fit a particular thinking pattern, was easier to understand.

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[24]Glenn W. Hayes, "The Relationship of Socio-economic Status of Pupils to their Comprehenison of Reference Materials Written at Different Levels of Readability." Dissertation Abstracts, XXVII (1966), 3773.

[25]Larry L. Blue, "A Study of the Influence of Certain Factors in Science Materials of the Reading Comprehension of Seventh Grade Pupils" (Unpublished Doctor's dissertation, Indiana U., 1964).

Burk[26] studied the influence stylistic factors such as sentence length and complexity and the use of direct or indirect conversation had on the interest, comprehension, and rate of reading of elementary grade pupils. Three forms of three stories were created. The results indicated that: (1) there was most interest in stories containing simple sentences and least in those with long complex and compound sentences; (2) the type of sentence in which a story was written had no influence on comprehension; (3) stories with long complex and compound sentences produced the highest rate of reading; (4) pupils tended to prefer stories written with direct conversation, and these stories tended to rank highest in comprehension and were read fastest.

Englemann[27] studied the relative merits of two forms of discourse when applied to children's factual content reading material. The reading materials were selected from textbooks and rewritten to make paired versions of all selections. The rewritten selections were in a conversational form and were kept close to the original which was written in expository style. Comprehension and retention scores of fourth and seventh grade students were obtained by multiple-choice tests. The results showed no significant differences at either grade level on the comprehension and retention scores of either style, but there were significant differences in reading rate favoring the rewritten material. Students at both grade levels favored the conversation style.

Weekes[28] studied the extent to which figures of speech and involved sentence structure obscured meaning and influenced elementary children's choices of poetry, as well as the extent to which experience as a factor of comprehension influenced their choices of poetry. Simplification of the alternate forms of the poems was accomplished in one test by amplification--adding words or phrases that would point out the likeness of comparison on which the figure of speech was based, and in another by rearrangement of descriptive phrases and clauses so that the sentences would be less involved. Comprehension of each poem was checked by means of a six-item true- false test. The results demonstrated that both figurative language and involved sentence structure tended to obscure meaning, but figurative language presented the most difficulty; that both are factors which influence children's choice of poetry because comprehension of what is read is a factor favorable to choice; and, that actual experience is a factor of choice with the tendency to select that with which one has had experience.

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[26]Cassie Burk, "A Study of the Influence of Some Factors in Style of Composition on the Interest, Comprehension, and Rate of Reading of Fourth Grade Pupils," J. of Experimental Education, IV (June, 1936,) 303-52.

[27]Finish E. Englemann, "The Relative Merits of Two Forms of Discourse when Applied to Children's Factual Content Reading Material," J. of Educational Research, XXIV (March, 1936), 524-31.

[28]Blanch E. Weekes, The Influence of Meaning on Children's Choices of Poetry, Contributions to Education, No. 354 (N.Y.: Teacher's College, Columbia U., 1929).

Wilson[29] prepared three articles she had written, each in a short, doubled, and long form. The criteria for expanding the passages was the investigator's judgment as to what could be added to the original passage to enable the pupils to use their experiential and linguistic backgrounds to attain adequate comprehension of the concepts. The subjects, sixth and seventh graders, read one article of each length but of different themes, and were tested for comprehension by free-expression, multiple-choice, word meaning questions, picture selection items, and oral interviews. The results showed a significant difference in the comprehension scores in favor of the long version especially in the case of the brighter pupils. The investigator suggested that a basic barrier to comprehension in reading is the difficulty of the material, and in these articles, the concepts met were made less difficult through amplification.

Gliessmann[30] studied the effect of abstractness and informal organization of reading material on reading performance and their relationship to certain selected intellectual characteristics. Specifically, he hypothesized that the ability to compare abstract and/or informally organized reading material would be limited by tendencies to form and use concrete verbal concepts or to react rigidly in verbal problem situations. High school juniors read two pairs of reading passages differing in the levels of abstractness-concreteness of the content, and in the formality-informality of the organization of the content. Other content variables such as word and sentence length were held constant, and the level of difficulty was kept at a fifth-sixth grade level. Comprehension tests with open responses, measures of reading rate and general reading performance, and tests of verbal concept formation and of rigidity in thinking were given. Abstract content reduced mean reading rate for females, informal organization reduced the amount learned from the content, and cognitive rigidity was positively related to general reading comprehension when intelligence was held constant. All other relationships and interactions were not significant.

Peterson[31] used high school textbooks to find out how well students comprehended the information, and what difficulties they encountered in reading. Reading comprehension was defined in five categories: (1) understanding words in context; (2) grasping thoughts as a whole; (3) noting specific details; (4) drawing correct inferences; and (5) inte-

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[29]Mary Wilson, "The Effect of Amplifying Material upon Comprehension," J. of Experimental Education, XIII (1944), 5-8

[30]David Gliessman, "Abstractness and Informal Organization of Reading Material: Their Effect on Reading Performance and Relationship to Selected Intellectual Characteristics" (Unpublished Doctor's dissertation, U. of Illinois, 1961).

[31]Eleanor M. Peterson, Aspects of Readability in the Social Studies (N. Y.: Bureau of Publications, Teacher's College, Columbia U., 1954).

grating facts and ideas with experience. Two history passages were selected, their content classified according to the five categories, and two tests of comprehension, one general and one analytical, were constructed. Both passages were modified in each category to provide greater interest and more logical organization. The subjects, tenth graders matched in equivalent reading ability groups, read one of the versions of the passage, and were given a free-response question test and a scale for rating the readability of the passage in terms of the modifications made and the interest value of the versions. The results demonstrated that those who read the modified passages had significantly higher comprehension scores on both the general, analytical, and free-response tests. On the rating scale, students indicated the version modified for high interest was enjoyed much more than either of the other versions.

Felix[32] attempted to design and test a technique for facilitating reader comprehension of a research report in the area of guidance. Two articles, unpublished but accepted by a professional journal for publication, were each produced in original and alternate forms. The alternate forms were created according to the investigator's standards for word length in syllables per hundred words, sentence length in number of words, paragraph length in number of words, paragraph length in number of sentences, section length in number of paragraphs, and division length in number of sections. A rating scale was constructed to test the reader's reaction to the format of the articles and to the overall quality of the articles. Copies of an original and rewritten version were mailed in cross combinations to four randomly selected groups of subscribers to the professional journal. They were asked to read the articles, complete the rating scale, and return both to the investigator. As the questionnaires were returned, a content questionnaire with four-part multiple choice items was sent out to measure the subjects' recall of the articles. There were no significant differences between the versions on any of the readers' reactions to the formats, nor any evidence that the rewritten versions actually produced better comprehension (recall).

Feldman[33] studied the effect of learning material organized into textual or programmed format, and the effect of difficulty of level of the learning material upon equated subgroups of high and low verbal ability college students. The textual format was created from the programmed format by filling in all the statements. Then two successively more difficult versions of both the programmed and textual formats were created by increasing sentence length with the use of conjunctions, and

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[32]Joseph L. Felix, "The Development and Evaluation of a Prescription for More Readable Reporting of Research in Guidance" (Unpublished Doctor's dissertation, U. of Cincinnati, 1967).

[33]Margaret E. Feldman, "Learning by Programmed and Text Format at Three Levels of Difficulty." J. of Educational Psych., LVI (June, 1965), 133-39.

by increasing word difficulty by use of synonyms. Comprehension of the textual material was tested by pre- and post-tests using the cloze technique, and on the programmed format by the number of items correctly answered. The results showed no pre-test differences between formats, but the pre-test differences among the levels of difficulty were significant. The high verbal group did significantly better than the low verbal group. There were no significant differences in gains attributable to any of the effects being studied. But, there was a significant interaction between verbal ability and reading difficulty--the high verbal group gained more when studying difficult material while the low verbal group gained more from less difficult material (but not the version with the lowest difficulty level), and did poorly on the most difficult material. There was a significant difference in favor of the textual format over the programmed format for the low verbal group.

Transformational changes. The following studies were based on the generative-transformational theory of grammar. The term "grammatical transformation" is used to mean a grammatically correct sentence which has the exact same meaning, or nearly the same, as another sentence. In one type of transformation, two sentences may have words in common which are based upon the same roots, but which might be used as another part of speech. For example, there are many words in English which are used as verbs but in another form may be used as nouns (know, knowledge). The latter is known as a "nominalization." In another type of grammatical transformation, a sentence may be put inside (embedded in) another sentence as a clause.

Coleman[34] reported the results of four closely related experiments in which the comprehensibility of different grammatical transformations were measured. In experiment I, two long prose passages were simplified by transforming passive verbs to actives, nominalizations using abstract nouns to their active-verb derivatives, and adjectivalizations to their adjectival or adverbial form. Experiment II was a replication of experiment I except that four passages and their alternatives were used. In experiments III and IV nominalizations were compared to their transformations using active verbs, and using sentences rather than long passages.

Comprehension was measured in various ways: in I, by multiple-choice questions; in II and III, by immediate recall of the exact wording; in IV, by the number of trials needed to perfect recall. All of the subjects were college undergraduates. The results of the four studies indicated that some transformations are easier to comprehend than others. The last three experiments showed that transformations using active verbs appear to be easier to comprehend than their nominalized counterparts.

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[34]Edward B. Coleman, "The Comprehension of Several Grammatical Transformations," J. of Applied Psych., XLVIII (June, 1964), 186-90.

Coleman[35] also compared pairs of grammatical transformations. In experiment I of four closely related experiments, 10 kinds of nominalizations were compared with their simplified grammatical transformations using the active verb. In experiment II active and passive sentences were compared. In experiment III, the investigator compared adjectivalizations and their adjectival or adverbial forms, and in experiment IV, he compared embedded sentences and their non-embedded transformations. Comprehension was tested in experiment I by the number of trials needed to memorize the sentences, in experiments II and III by the number of words correctly remembered after a timed exposure, and in experiment IV by a cloze procedure. Again the subjects were college undergraduates. The results indicated that active-verb transformations were significantly easier to learn than their passives, and that non-embedded sentences were easier to learn than their embedded counterparts, but there was no difference between adjectivalizations and their counterparts using adjectives. Sentences containing transformations which have shorter clauses and fewer words seem to be more easily processed than versions containing long clauses and more words.

Coleman and Blumenfeld [36] compared nominalized sentences to their grammatical transformations using active verbs. The materials were two paragraphs from a college textbook containing: (1) a high percentage of abstract nouns nominalized from verbs, and (2) 10 sentences each containing two such nominalizations. In the alternate versions the nominalizations were transformed to active verbs. Comprehension was tested by five cloze tests for each set of paragraphs and sentences so a score was obtained for every word in both versions of the material. The results demonstrated that the cloze test scores were significantly higher for materials containing the active verb form. Also, a significantly greater number of content words were correctly inserted in the active verb versions. The investigators concluded that word patterns of the active word passages are more predictable, and it is this predictability which allows more information to be passed on.

Language patterns. Ruddell[37] studied the effect of the similarity of oral and written patterns of language structure on the reading comprehension of fourth grade children. He hypothesized: (1) that the degree of understanding with which written passages were read would be a function of the similarity of the child's oral pattern of language

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[35]Edward B. Coleman, "Learning of Prose Written in Four Grammatical Transformations," J. of Applied Psych., XLIX(1965), 332-4.

[36]Edward B. Coleman & J. P. Blumenfeld, "Close Scores and Nominalizations and Their Grammatical Transformations Using Active Verbs," Psych. Reports, XIII (December, 1963), 651-54.

[37]Robert Ruddell, "An Investigation of the Effect of the Similarity of Oral and Written Patterns of Language Structure on Reading Comprehension" (Unpublished Doctor's dissertation, U. of Indiana, 1963).

structure to the written patterns of language structure; and (2) that the comprehension scores on the reading passages that used high frequency patterns of oral language would be greater than those scores on passages that used low frequency patterns. A series of structurally-controlled reading passages having a wide range of similarity indexes were designed. The indexes were determined by giving empirically-determined frequency values of the oral patterns of fourth grade children to identical written patterns of language structure in reading passages and totaling the assigned frequency values. Vocabulary difficulty, sentence length, subject matter content, and passage length were equated. Cloze comprehension tests were constructed on both forms of passages. The results showed highly significant differences favoring the high frequency pattern passages thereby supporting both hypotheses. Significant differences were found in comprehension scores on reading passages using high and low patterns in relation to numerous background variables, except sex. The conclusions were that (1) reading comprehension is a function of the similarity of a child's oral patterns to the written patterns in reading material, and that (2) certain background variables are related to reading comprehension, although boys did have disproportionately greater difficulty in comprehending material written with low frequency patterns.

Tatham,[38] using Ruddell's passages, constructed 14 items to measure literal comprehension, inferential comprehension, evaluation, and appreciation. The results indicated that the comprehension scores on the high frequency passages were significantly greater than on the low frequency passages, that intelligence was related to reading comprehension, and that there was no difference between the comprehension scores of boys and girls. In a later study, Tatham[39] used children in two grade levels, second and fourth, and gave them the task of reading a sentence and selecting one of three similar pictures that best represented the sentence content. Vocabulary, content, and grammatical complexity were controlled across the tests. The results, similar to her earlier study, showed that the children in both grades had significantly higher comprehension scores on the tests with high frequency patterns, that the children in fourth grade scored significantly higher than those in second grade on both tests, and that there were no differences in comprehension scores between the sexes.

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[38]Susan M. Tatham, "Using Multiple Choice Questions to Measure the Effect on Comprehension of Material Written with Select Oral Language Patterns" (Paper read at the American Educational Research Association convention, February, 1968, Chicago, Ill.)

[39]Susan M. Tatham, "Reading Comprehension of Materials Written with Select Oral Language Patterns: a Study at Grades Two and Four," Reading Research Quarterly, V (Spring, 1970), 402-26.

Smith[40] Using the written language patterns of various age groups, investigated what effect varying the syntactic structure of a passage had on reading difficulty when vocabulary and content were controlled. Four passages were constructed representing four levels of written syntactic maturity: fourth grade, eighth grade, twelfth grade, and skilled adult. Subjects were selected from grades four through 12, and in each grade, divided into four groups, each group receiving one of the passages. The cloze technique was used to measure comprehension. Subjects in grades four, five and six read fourth grade writing best while subjects in grades eight through 12 read eighth grade writing best. Older subjects read fourth grade writing least well. The results demonstrated that syntax did make a difference in reading difficulty, and that there seemed to be a correspondence between subjects' level of syntactic maturation and the syntactic level of the material they read best.

Summary. The results of these studies are difficult to evaluate because, unlike the studies in which the principles of readability formulas were applied, no consistent standards were used to create the revised, simpler forms. A tentative conclusion to be drawn, though, is that concepts can be clarified for increased understanding through amplification, and the logical ordering of ideas.

ORAL READING MIS-CUES

Kenneth Goodman used the term "mis-cues" to indicate those apparent oral reading errors which were caused by the reader's response to some grammatical language feature rather than by the reader's incorrect analysis only of the phoneme-grapheme relationships in the word.[41] The results of this study of the oral reading of primary grade children demonstrated the importance of context in word recognition; from this study Goodman developed his preliminary Linguistic Taxonomy of Cues and Mis-cues in Reading. Subsequent research by Goodman and his associates[42] has been used to refine and clarify the Taxonomy, which is now used for the depth analysis of oral reading responses which deviate from the expected responses of the page.

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[40]William Smith, "The Effect of Transformed Syntactical Structures on Reading," Language, Reading and the Communication Process, ed. Carl Braun (Newark, Del.: IRA, 1971), 52-62.

[41]Kenneth S. Goodman, "A Linguistic Study of Cues and Miscues in Reading," Elementary English, XLII (October, 1965), 639-43.

[42]Kenneth S. Goodman, "Analysis of Oral Reading Mis-cues: Applied Psycholinguistics, " Reading Research Quarterly, V (Fall, 1969), 9-30; see also Kenneth S. Goodman and Carolyn L. Burke, "Manual for the Use of Miscue Analysis," Preliminary Edition (Detroit: Wayne State University, September, 1970). (Mimeographed)

Using the Goodman Taxonomy to code readers' mis-cues, Yetta Goodman and others found that mis-cues were a normal part of the reading process of elementary school children, and that it is the quality of the mis-cue which should be used for diagnosis rather than the number of mis-cues per hundred words.[43]

Kenneth Goodman and Burke[44] reported that by analyzing reading mis-cues according to the grammatical classifications they represented, it was possible to confirm the interplay of syntactic, semantic, and phonological information in the reading process.

Continuing their research, Kenneth Goodman and Burke[45] analyzed those mis-cues which resulted in grammatical re-transformations of the expected responses in the written material. Three types of re-transformations were identified: (1) the reader infers a different deep structure from that of the author; (2) the reader infers the same deep structure as the author, but uses a different set of transformation rules to produce a surface structure of the sentence; (3) the reader infers the same deep structure as the author, but uses an alternate set of transformation rules to produce the surface structure.

Other investigators also have been concerned with studying the utilization of language in reading. They provide additional evidence to indicate that oral reading responses which deviate from what is printed on the page are influenced by a knowledge of the syntax of the language.

Labov[46] distinguished between reading errors based on the printed sentence (surface structure) and those based on the underlying meaning of the sentence (deep structure). He found that although none of his subjects, Negro teenagers, responded to the past tense marker -ed, there were two distinct pronunciations of the word read depending upon whether or not the subjects inferred the past tense for the entire sentence.

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[43]Yetta Goodman and others, "Studies of Reading Miscues" (paper read at the International Reading Association convention, May, 1969 Kansas City, Mo). Also Ed 033-831.

[44]Kenneth S. Goodman and Carolyn L. Burke, Study of Children's Behavior While Reading Orally, Final Report, Project #425, Contract #OE-610-136 (Washington, D. C.: U. S. Office of Education, 1968).

[45]Kenneth S. Goodman and Carolyn L. Burke, A Study of Oral Reading Miscues that Result in Grammatical Re-transformations, Final Report, Project #7-E-219, Contract #OEG-0-8-070219 (010) Washington, D. C.: U. S. Office of Education, 1969).

[46]William Labov, "Some Sources of Reading Problems for Negro Speakers of Non-standard English" (paper read at N.C.T.E. Spring Institute on New Directions in Elementary English, March, 1966, Chicago, Ill.).

Weber[47] found that first grade children made incorrect oral reading responses that generally conformed to the immediately preceding grammatical and semantic context. This suggested that the children expected the sentences they read to conform to the structure of the language they already knew.

Clay[48] reported that the syntactic structure was a source of reading errors for young children whose guesses at points of uncertainty were dominated by their control over the syntax of the language. It seemed that the children tended to pay little attention to the actual visual stimulus and depended more heavily upon their knowledge of how language works.

Hittleman[49] attempted to discover whether text revised on the basis of students' oral reading mis-cues resulting in re-transformations had greater readability than the original text. The subjects, 177 secondary school students in a general science course, were assigned to one of three ability groups based upon scores from the Diagnostic Reading Test. Oral reading protocols, taken on a science passage from a stratified random sub-sample of 24 subjects, were analyzed through the use of the Burke and Goodman Reading Miscue Inventory (RMI), an instrument developed to examine possible psycholinguistic causes of oral reading responses deviating from the expected responses of the text (mis-cues). Using the results of the analysis, a revised passage of the science text was written. After verification of their content equivalency, the original and revised passages were each separated into two parts of approximately equal length. A cloze readability text was created over all four passage subdivisions by deleting every fifth word beginning word beginning with the second sentence in each part. Two forms, each containing half of the original and half of the revised passages, were combined into booklets with the same cover sheet, and randomly assigned to the remaining 132 subjects--those not lost through attrition nor part of the sub-sample.

The effects of textform and ability leval on the readability scores were measured by two way analyses of variance for unequal cells. The first research hypothesis predicting a lower readability level for the revised passage, and the third hypothesis predicting an interaction between textform and reading ability level were not verified. The second hypothesis predicting a significant effect of the subjects' reading level on their readability scores was verified.

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[47]Rose-Marie Weber, "A Linguistic Analysis of First Grade Reading Errors," Reading Research Quarterly, V (Spring, 1970), 426-51

[48]Marie M. Clay, "A Syntactic Analysis of Reading Errors," J. of Verbal Learning and Verbal Behavior, VII (April, 1968), 434-38.

[49]Hittleman, Daniel R., "The Readability of Subject Matter Material Re-written on the Basis of Students' Oral Reading Miscues" (Unpublished Doctor's dissertation, Hofstra U., 1971).

Because of the inconclusive statistical findings, the revised passage was never validated; therefore, any generalizations made from this study must be considered as highly tentative, and perhaps most valuable as insights for further investigations. This study served as a pilot study for the present investigation.

CONCLUDING REMARKS

Several conclusions are suggested through an analysis of the research on readability measurement of different versions of the same material, and on utilization of language in reading.

1. No significant differences can be expected between measures of readability of material and a revision of that same material when the revision is based only upon the factors of vocabulary substitution, sentence length, average syllabic word length, paragraph length, or whole selection length.

2. The difficulty of any written material will be in direct proportion to the degree to which the language and style in which the material is written deviates from the language patterns and styles with which the reader has had experience.

3. The surface structure of a sentence affects the ease with which it can be read, and the more transformations that occur between a sentence's deep structure and its surface structure, the more difficult that sentence will be to understand.

4. Readers utilize their expectations about reading material based upon their knowledge of language and how it operates, and the oral reading responses of readers reveal the manner in which they attempt to gain understanding.

5. The exploration of the readability of material which has been grammatically restructured to meet the language expectations of the intended readers where sampling has revealed particular passages to be difficult or confusing for this population will be profitable.

6. A need exists to obtain more information about how high school age subjects attempt to gain information from typical material that they will be expected to read.

Chapter 3

PURPOSE, DESIGN, AND PROCEDURES

The purpose of this study was to investigate whether high school subject matter text, revised on the basis of secondary school students' oral reading mis-cues that result in grammatical re-transformations, had greater readability than the original text.

This study encompassed two phases: (1) a descriptive phase, and (2) an experimental phase.

HYPOTHESIS

The following research hypothesis was tested in the experimental phase of this study:

> The mean readability scores for the revised passages will be significantly higher than the mean readability scores for the original passages.

Definition of Terms

1. Subject Matter Text: Prose found in typical secondary school social studies, English and science textbooks regardless of topic but with a minimum of arithmetical or scientific notation.

2. Mis-cues: Observed responses during oral reading which differ from the expected responses on the printed page. They are generally caused by the reader's response to some grammatical language feature rather than solely the reader's incorrect analysis of just the phoneme-grapheme relationships in the word.

3. Grammatical Transformation: A grammatically correct sentence which has the same, or nearly the same, meaning as another sentence.

4. Grammatical Re-transformations: Any changes in grammatical structure which occur to a textual sequence during oral reading.

5. Readability: The measure of how easy or difficult a passage is to read. High scores on a cloze procedure test represent a less difficult level of readability than do low scores.

6. Reading Ability: The level of study type reading skill needed to read material similar to that found in textbooks in social studies and science as measured by a standardized silent reading test.

Delimitations

This study was based on the assumption that reading is a psycholinguistic process in which there is an interaction between the reader and the written language as the reader tries to reconstruct the writer's meaning. This theory of reading is, in turn, based upon a generative-transformation theory of grammar in which it is hypothesized that ideas can be presented in more than one syntactical pattern.

Also this study was based on an assumption that it might be worthwhile to provide instructional materials designed specifically for the learners. In addition it was assumed that the oral reading mis-cues of a sub-sample represented in kind and degree the miscues which would be obtained if the oral reading of all subjects had been analyzed.

The study was limited in that the subjects were ninth grade students within a single secondary school.

DESCRIPTIVE PHASE

In this phase, information was collected and analyzed concerning the types and patterns of mis-cues that a sub-sample of the study population produced by reading the subject matter text passage orally.

Sample

The subjects for this study were drawn from the ninth grade students of the Farmingdale, Long Island, N. Y. Public Schools. In Nassau County about 15 miles from the New York City border, the Farmingdale School district consists of a mainly suburban, residential area covering 12 square miles. Its population of approximately 48,000 spans the socio-economic range of low-middle to high-middle class. About 12,000 students attend the schools of Farmingdale, approximately eight percent of whom are non-white. Five percent of the students in the secondary schools are non-white. About two fifths of the graduates of its high school go on to four year institutions of higher learnings, about one-third go on to two year institutions.

From a total of 1021 ninth grade students, the sample for the descriptive phase of 217 students was drawn by randomly selecting 10 sections of ninth grade English. During the fall of 1971 the comprehension part of the Diagnostic Reading Test, Survey Section, (Upper Level, Form B) was administered to all subjects during one of their regular English class periods by the regular classroom teacher. Besides the normal instructions of the Diagnostic Reading Test, the subjects were informed that the investigators were trying to find out how students read textbook material and that the testing would have no effect on their regular class grades.

After the tests were scored, the subjects were assigned to stanine levels based upon the national norms supplied by the publisher. Three reading ability levels, respectively labeled as low, average, and high reading ability levels, were formed by grouping stanines 1, 2, and 3; 4, 5, and 6; and 7, 8, and 9. Table 1 shows the distribution of subjects in the descriptive phase sample among the three reading levels.

Table 1. Distribution of Subjects in Descriptive Phase Sample by Reading Levels

Reading Level	Number of Subjects	Percent of Sample
High	53	25
Average	106	48
Low	58	27
Total	217	100

In the spring of 1972, the sub-sample was formed by a random selection of 23 subjects. The number of selected subjects for each reading ability level was in direct proportion to the number of subjects in each ability level in the sample. A table of random numbers was used in the selection of the sub-sample. Table 2 shows the distribution of subjects in the sub-sample among the three reading levels.

Table 2. Distribution of Subjects in Sub-sample by Reading Levels

Reading Level	Number of Subjects	Percent of Sub-sample
High	6	26
Average	12	52
Low	5	22
Total	23	100

Passage Selection

One passage each in the subject matter areas of social studies, English, and science was selected from typical ninth grade texts. The selections were made from recent texts not in use in the school in which the study was undertaken.[1] A passage was selected which: (1) allowed at least 50 cloze items; and (2) had a minimum of arithmetical or scientific notation.

In order to eliminate as much personal bias as possible in the selection of the passages, a table of random numbers was used. The first passage meeting the criteria which began on one page before or one page after a randomly selected page was used. The complete texts of the original passages appear in Appendix A. Permission was obtained from the publishers to duplicate and revise the passages for the purpose of this study.

Analysis of Mis-cues

Each subject in the sub-sample individually read the three subject matter passages orally to an investigator. The order of presentation was varied and the subjects were randomly assigned to one of the six possible order groups. A time was scheduled for each subject to read the passage during one of his study-hall periods.

Appendix A contains both the passages and the specific instructions given to each subject before reading the passages. The subjects' responses were tape recorded as they read and the investigator made notations on a worksheet.

Upon completion of reading each passage, the subjects related, in a free recall response situation, what they remembered from the reading. Although no attempt was made to quantify the results of this oral recall, the protocols were examined to gain additional insights about the readers' ability to understand the main ideas of the passages. (See Appendix G.)

A complete transcript was made of the oral reading responses of every subject. Each observed response (O.R.) which deviated from the expected response (E.R.) was examined and tabulated as one mis-cue if it was:

1. A substitution of a word

   E.R.: ...on a firm footing...

   O.R.: ...on a firm footage...

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[1] Crain, Clark and others, World Culture Groups (N.Y.: W. H. Sadlier, Inc., 1970), p. 184-85; Roberts, Paul, The Roberts English Series: A Linguistic Program, Complete Course (N. Y.: Harcourt Brace Jovanovich, 1967), p. 8-9; and Weisbruck, Fred, Patterns and Processes of Science, Laboratory Text #3 (Lexington, Mass: D. C. Heath, 1968), p. 396.

2. An insertion of a word

E.R.: ...on a year-to-year...

O.R.: ...on a one year-to-year...

3. An omission of a word

E.R.: ...the mass of the material...

O.R.: ...the mass of material...

4. A reversal of two or more words

E.R.: ...we are working...

O.R.: ...are we working...

5. A repetition of one or more words to correct intonation or to abandon a correct response.

E.R.: ...more often on a...

O.R.: ...more often on....more often than a...

6. An intonation pattern which showed a change in phrase or clause structure.

E.R.: ...react with each other in the...

O.R.: ...react with each other. In the...

7. A complex change in which one change caused a further immediate change which was strongly inter-related.

E.R.: ...new way of life takes...

O.R.: ...new ways of life take...

For the purposes of this study, an observed response which deviated from the expected response was not tabulated as a mis-cue if it was:

1. A partial word substitution, correct to the stopping point and then repeated as the whole word

E.R.: ...how to request things...

O.R.: ...how to /re-kw/...request things...

2. A repetition of a word or phrase to maintain comprehension or anticipate what follows

3. A mispronunciation of a proper noun

4. An allolog (any of the variant forms or pronunciations of a word).

E.R.: occasion

O.R.: /uh-KAY-shun/, or /oh-KAY-shun/

Each mis-cue that occurred in the protocols was analyzed through the use of the Reading Miscue Inventory (RMI).[2]

In this study, the dialect system of the subjects was assumed to be "standard American English" as is commonly heard in the New York City and Long Island area on radio and television newsbroadcasts. The investigators were most concerned with those characteristics of mis-cues which resulted in syntactic and semantic change. (Appendix C contains an outline of the complete Reading Miscue Inventory. Appendix D contains examples of the types of mis-cues recorded in this study.)

Dr. Kenneth S. Goodman, Director of Reading Miscue Research, School of Education, Wayne State University, assisted the investigators in developing proficiency in coding the mis-cues and offered suggestions about utilizing the mis-cue analysis in the formation of the revised passages. The reliability of the investigators' analysis of the mis-cues, according to the Reading Miscue Inventory, was established during a pilot project.[3]

Revised Passage

The final decision of how to write the revision remained with the investigators. Aside from some obvious changes signaled by the mis-cue analysis, the investigators used some general principles for guidance. When the mis-cues seemed to be caused by a general language feature, the revision was based upon the literature on the readability of different grammatical transformations. Because the pilot study[4] gave some evidence that the amount of meaning change assigned to a mis-cue might be different for different purposes, a consultant in each of the subject matter areas analyzed the original passages and indicated the main ideas and a purpose for which the passage could be read in a typical classroom. The three were: Mr. Joel Surgal, Chairman of the Social Studies Department, University of Chicago Laboratory Schools; Mr. Jerry Ferguson, Chairman of the Science Department, University of Chicago Laboratory Schools; and Dr. Filmore Peltz, Chairman of the English Department, Springfield Gardens

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[2]Goodman, Yetta M., and Carolyn L. Burke, Reading Miscue Inventory, Mannual (N. Y.: Macmillan, 1972).

[3]Hittleman Daniel R., "The Readability of Subject Matter Material Re-written on the Basis of Student's Oral Reading Miscues." (Unpublished Doctor's dissertation, Hofstra U., 1971), p. 109-111

[4]Hittleman, p. 124.

High School, New York City. The final drafts of the revised subject matter passages were submitted to the consultants for content evaluation. The validity of the revisions made by the investigators was tested through the study itself.

Appendix B contains the complete final texts of the revised passages.

EXPERIMENTAL PHASE

In this phase, information concerning the readability levels was collected and measured.

Selection of the Experimental Phase Sample

In the fall of 1972, five ninth grade English classes were randomly selected and the students within those classes comprized the sample for the experimental phase. The Diagnostic Reading Test was administered to 96 students.

Table 3 shows the distribution of the experimental phase subjects among the three reading ability levels. Table 4 summarizes the results of a "t" test between the reading ability scores of the descriptive phase sample and the experimental phase sample. No significant difference was found in reading ability between the groups.

Table 3. Distribution of Subjects in Experimental Phase Sample by Reading Levels

Reading Level	Number of Subjects	Percent of Sample
High	22	23
Average	47	49
Low	27	28
Total	96	100

Table 4. Test of Significance Between the Reading Ability Scores of the Descriptive Phase Sample and the Experimental Phase Sample (see next page)

Sample	N	Mean	S.D.	t
Descriptive Phase	217	22.95	6.78	.60
Experimental Phase	96	22.45	6.89	

p .05 = 1.96

Construction of the Readability Tests

A cloze readability test was created for each of the original and revised subject matter passages for a total of six readability tests. The cloze tests were created by deleting 50 content words beginning with the fifth word of the second sentence of each of the original passages. The procedure was to count five words and delete that word if it was a content word. If the word was a structure word, the first content word after the indicated word was deleted. The counting of five words always began with the word after the deleted content word. When 50 words had been deleted, the procedure was stopped. Content words were considered to be nouns, main verbs, and adjectives.

Cloze tests for the revised passages were created by deleting the exact same words as were deleted from the original passages. If a word did not appear in the revised subject matter passage, another content word was selected from the original passage that did appear in the revised passage. The only exception to this rule was when a synonym had been substituted in the revised passage. Then the synonym of the original word was deleted in the revised passage. Each deleted word was replaced with a blank line five spaces long and the spaces were consecutively numbered.

The rationale for deleting only content words came from the pilot study in which a possible limitation of the "every nth" word cloze procedure was indicated.[5] It was concluded that a more valid procedure when dealing with multiple versions of a passage might be to delete only the content words so that an investigator can get a measure of the effect of the revision--syntactic and semantic--upon the reader's ability to recreate the passage content in its entirety.

The readability tests were duplicated and combined with a common cover sheet which had directions to the subjects and a short practice exercise. The students recorded their answers on a separate answer form. Appendix F contains the six readability test forms and the common direction and answer sheets.

Administration of the Readability Tests

Each of the 96 subjects in the experimental phase sample were

[5]Hittleman, p. 123.

randomly assigned one of the readability test forms. The tests were administered during a regular English period by one of the investigators. Table 5 summarizes the reading ability scores of the six groups receiving the original and revised subject matter passages. There were no significant differences between any of the groups in reading ability.

Table 5. Reading Ability Scores for the Groups Receiving the Readability Test Forms

Group	N	Mean	S.D.
Original			
Social Studies	16	23.37	7.09*
English	16	22.37	6.61
Science	16	22.50	7.12
Revised			
Social Studies	16	21.87	6.67*
English	16	22.06	6.55
Science	16	22.93	6.68

*t = .59 (p.05 = 2.04)

Scoring

The readability tests were scored first for exact words that successfully completed the sentences, and then for synonyms which retained the basic meaning of the entire passage. The answer keys included in Appendix F contain the synonyms accepted as correct.

Treatment of the Data

The data collected in the experimental phase of this study were analyzed in two ways: (1) to estimate the reliability of the cloze procedure readability tests, and (2) to test the research hypothesis.

Test reliability. The reliability of the cloze procedure test was estimated by a split-half correlation procedure on each of the six readability tests. A product-moment correlation coefficient was estimated between the scores on the even numbered items and the scores on the odd numbered items. The Spearman-Brown Prophecy Formula was used to correct the obtained reliability coefficients.

Hypothesis testing. The data related to the research hypothesis were analyzed by a two-way analysis of variance. The two main effects were: (1) the form of the passages--original or revised; and (2) the subject matter of the passage--social studies, English, or science. An analysis of variance was computed for both exact word and synonym scores.

All measures were considered significant if they equaled or exceeded the .05 level.

Chapter 4

FINDINGS AND DISCUSSION

The goal of this chapter is to present the findings of this investigation and a discussion of those findings in respect to the collection of the data in its two phases. The information relating to the descriptive phase is an analysis of the mis-cues obtained from oral readings of the subject matter passages which were used as the basis to create the revised passages. The results of the experimental phase are presented in relation to the main effects in the analysis of variance of the research hypothesis of this study.

FINDINGS OF THE DESCRIPTIVE PHASE

Description of the Mis-cues

The oral reading of the three subject matter passages by the sub-sample resulted in a total of 1,465 recorded mis-cues. There were 421 mis-cues recorded on the social studies passage, 512 mis-cues recorded on the English passage, and 532 recorded on the science passage. Table 6 summarizes the total and mean number of mis-cues produced by each reading ability level for each of the subject matter passages. It can be noted from Table 6 that the low and average reading ability groups had a similar mean number of mis-cues across passage type. The high ability group had a lower mean number of mis-cues across passage type than did the other two groups. All three ability levels had a lower mean number of mis-cues on the social studies passage than on the English or science passages.

Chi square analyses were computed of the mis-cues produced on each of the subject matter passages. Five comparisons were made for each passage: (1) the amount of graphic similarity between the observed response (OR) and the expected response (ER); (2) the amount of sound similarity between the OR and ER; (3) the amount of change in the grammatical function of the OR in relation to the ER; (4) the degree of comprehension loss caused by the mis-cue; and (5) the degree of concern of the reader that his reading sounded like language (grammatical relationship).

Social studies passage mis-cues. Table 7 summarizes the percentage of mis-cues by category for each reading ability group on the social studies passage. The chi square comparisons indicate a significant difference among the reading levels for all categories; in each case the high ability group had responses with a different pattern than those of the low and average groups which had similar patterns in all of the categories.

In the graphic similarity category, the greater percentage of the low and average groups ORs had partial similarity with the ERs. The ORs of the high group were more evenly distributed, but the greater

Table 6. Total and Mean Number of Mis-cues by Reading Ability Level and by Subject Matter Passage

Reading Level	N	Total Mis-cues				Means		
		Soc. St.	Engl.	Sci.	Total	Soc. St.	Engl.	Sci.
Low	6	116	162	153	431	19.3	27.0	25.5
Average	12	246	293	326	865	20.5	24.4	27.2
High	5	59	57	53	169	11.8	11.2	16.4
Total	23	421	512	532	1465			

Table 7. Percentage of Miscues by Category for Each Reading Ability Group on the Social Studies Passage

Reading Level	Graphic Similarity			Sound Similarity			Grammatical Function			Comprehension			Grammatical Relationships			
	Yes	Partial	None	Yes	Partial	None	Yes	Partial	None	No Loss	Partial Loss	Loss	Strength	Partial Strength	Weakness	Overcorrections
Low	15	63	22	20	66	14	67	13	20	45	17	38	44	30	23	3
Average	16	55	29	19	58	23	68	13	19	41	26	33	40	23	34	3
High	36	21	43	36	28	36	57	32	11	61	17	22	42	7	42	9
χ^2	41.576**			33.181**			16.526**			11.594*			24.406**			

*P < .05 **P < .01

percentage of this groups ORs had no similarity with the ERs.

In the sound similarity category, the greater percentage of the low and average groups' ORs had partial similarity to the ERs. Again the high group's ORs were evenly distributed.

In the grammatical function category, all the ability groups had similar patterns in that the greater part of their ORs had the same grammatical function as the ERs.

In the comprehension category, the low and average groups had a similar pattern in that the greater percentage of their ORs showed no comprehension loss. The high group had the same pattern, but a greater percentage of their ORs showed no loss.

In the grammatical relationships category, the greater percentage of the low and average groups' ORs showed strength or partial strength in using grammatical relationships of the passage to determine its meaning. The high group showed about an equal distribution between strength and weakness in this category and also showed a somewhat greater tendency than the other two groups to overcorrect.

English passage mis-cues. Table 8 summarizes the percentage of mis-cues by category for each reading ability group on the English passage. The chi square comparisons indicate a significant difference among the reading levels for all categories except grammatical functions.

In both the graphic similarity category, and the sound similarity category, the high ability group had fewer ORs which retained none of the similarity of the ERs than did the other two ability groups. The low group had the greater proportion of its ORs which retained a partial similarity with the ERs.

In the grammatical function category, all three groups displayed a similar pattern of responses. All had ORs which to a large extent were similar in grammatical function to the ERs.

In the comprehension category, the low and average groups had similar patterns in that there was a tendency for their ORs to show a loss or partial loss of understanding. The high group had a significantly different pattern in that a greater proportion of their ORs showed no loss of understanding.

In the grammatical relationships category, the high group had a significantly different pattern than the other two groups in that more of its ORs indicated a strength in using grammatical relationships. Also, the high group showed greater evidence of overcorrecting.

Science passage mis-cues. Table 9 summarizes the percentage of mis-cues by category for each reading ability group on the science passage. The chi square comparisons indicate a significant difference among the reading levels for all categories except grammatical function. In all categories, the pattern of responses was similar to those obtained on the social studies passage.

Table 8. Percentage of Mis-cues by Category for Each Reading Ability Group on the English Passage

Reading Level	Graphic Similarity			Sound Similarity			Grammatical Function			Comprehension			Grammatical Relationships			
	Yes	Partial	None	Yes	Partial	None	Yes	Partial	None	No Loss	Partial Loss	Loss	Strength	Partial Strength	Weakness	Overcorrections
Low	0	87	13	0	86	14	74	7	19	25	33	42	32	23	43	2
Average	8	61	31	7	65	28	71	5	24	27	35	38	37	21	37	5
High	11	85	4	11	74	15	78	7	15	50	34	16	45	7	32	16
χ^2	59.107**			19.714**			2.857			23.661**			26.997**			

*P ≤ .05 **P ≤ .01

Table 9. Percentage of Mis-cues by Category for Each Reading Ability Group on the Science Passage

Reading Level	Graphic Similarity			Sound Similarity			Grammatical Function			Comprehension			Grammatical Relationships			
	Yes	Partial	None	Yes	Partial	None	Yes	Partial	None	No Loss	Partial Loss	Loss	Strength	Partial Strength	Weakness	Overcorrections
Low	17	70	13	19	71	10	72	8	20	26	31	43	37	27	35	1
Average	15	57	28	19	57	24	70	5	25	24	35	41	32	20	45	3
High	2	85	13	4	85	11	74	2	24	48	27	25	52	13	30	5
χ^2	25.560**			24.369**			4.320			17.246**			16.121*			

* $P < .05$ ** $P < .01$

Summary of mis-cue analyses. All of the reading ability groups seemed to use partial sound and graphic cues to a large extent. All three groups also were utilizing syntactic cues in that most of their mis-cues retained the grammatical function of the original passage.

The social studies passage appeared, by a comparison of the comprehension category responses, to be the more readable passage for all reading ability levels. An examination of the mis-cue patterns of the three ability groups across the three subject matter passages in the comprehension category indicated that each group had a greater proportion of miscues showing no loss of comprehension on the social studies passage than on the English or science passages. The high ability group seemed to have less difficulty comprehending the Englisb and science passages than did the low and average groups.

All three reading ability groups seemed to utilize correction strategies and attempted to make the passages sound like normal language; however, the high ability group was able to do this to a greater degree than the other groups. This group also had a greater tendency to overcorrect their mis-cues.

Rationale for Revision of Subject Matter Passages

The revisions of the subject matter passages were undertaken after a line by line analysis of the combined mis-cues of all the subjects in the sub-sample. A composite protocol was made of all the miscues for each passage. Every mis-cue was considered in the rationale for change; however, it soon became evident that patterns of mis-cues began to emerge. This phenomenon of mis-cue "bunching" was consistent with what had been found in the pilot study and was verified by Kenneth S. Goodman, general consultant to the study, as being consistent with previous mis-cue research. The phenomenon is indicated on the composite protocol as a bunching of mis-cues in the vicinity of a confusing or ambiguous syntactical and/or semantic construction.

Following is a discussion of the conclusions drawn about the mis-cues on the subject matter passages. The paragraph references are to the original passages as they appear in Appendix A.

The social studies passage. The main idea of this passage, as indicated by the subject matter consultant, is to show the conflicts and difficulties inherent in cultural change; it shows the reversal of traditions into modern society.

The mis-cues seem to indicate a general confusion with the subordination of ideas due to a lack of "link" words in the original passage. Also, an examination of the oral recall protocols revealed some confusion about "New Africa" being a single country rather than a generic term for all the emerging nations of that continent.

In the first paragraph, there was evidence of confusion with the first sentence beginning with a subordinate clause--the subject of the sentence was not easily detected. The sequence of ideas in the second sentence resulted in some verb gerunds being converted into nouns

and in a change in phrase structure. Throughout the second half of this paragraph there was indication that the use of an "inductive" approach did not fully reveal the concept being developed.

In the second paragraph the main confusions seemed to be caused by the use of constructions involving ellipsed subjects and the use of the passive voice. There was also confusion over the concepts of a "clear title" and "mining" the soil.

In the third paragraph, there was another use of an ellipsed subject. The phrase at the beginning of the second sentence seemed gratuitous and caused some confusion. The use of the contrast signal "however" at the end of a sentence caused much confusion and resulted in changes in clause structure. The use of the term "revolution" in the last sentence caused confusion.

In constructing the revised social studies passage, there was an attempt to eliminate the confusing sections by substituting alternate terms, changing the syntactical patterns, and reordering the sequence of ideas. In the opinion of the subject consultant, the revision indicated (1) increased economy of expression, and (2) heightened prospects for greater understanding of vocabulary/concept retention.

The English Passage. The main idea of this passage, as indicated by the subject matter consultant, is to show that we have learned, and we use a set of rules for sentence production.

The mis-cues seem to indicate a general confusion with the grammatical relationships within this passage. Analysis revealed that most mis-cues resulted in a loss or partial loss of comprehension and a weakness in using the grammatical relationships. There was a greater spread of the mis-cues throughout the passage than in the social studies passage resulting in much less "bunching" of mis-cues. This lack of bunching together with the fact that in comparison to the social studies passage a greater number of total mis-cues were produced and that fewer mis-cues resulted in no comprehension loss, seems to indicate much more confusion by the students with the syntactic and semantic components.

Throughout the passage confusion seemed to be caused by a lack of consistency in phrasing and series cues, a constant shift in tense, especially the use of the past tense to indicate an on-going action or process, and the alternate use of the passive and active voices.

In the first paragraph, there was some indication of confusion over the tense and person cues and unusual phrasing patterns.

In the second paragraph, confusion was caused by an apparently unfamiliar construction at the end of the first sentence and in the third sentence. There was some confusion with the modifiers of the word "dictionary," and the fact that the third sentence began with a question cue.

In the third paragraph, confusion was caused by the use of the term "mechanism" to mean "process." Also, confusion was caused by the omission of "and" to signal the end of a series. The construction of the

second sentence also cued the students to expect a question. The construction of the fifth sentence seemed to be unfamiliar to the students, and they were confused by the ambiguous antecedent of the word "they" at the beginning of the last sentence.

In the fourth paragraph, confusion was caused mostly by semantic cues. In the first sentence, the students seemed to expect the word "conscious" to be an adverb; in the second sentence, the words "here" and "there" seemed to indicate to them the idea of "location"; and in the last sentence, confusion was caused by the phrase "a grammar".

In constructing the revised English passage, there was an attempt to eliminate the confusing sections by creating more natural sentences, inserting markers to signal the termination of a series, and making the tense, person, and voice of the passage consistent. In the opinion of the subject consultant the revised passage is equivalent in content and intent to the original.

The science passage. The main idea of this passage, as indicated by the subject matter consultant, is to show the use of chemical solutions in facilitating chemical reactions.

The mis-cues in this passage were generally spread evenly over the entire selection with little bunching or clustering except in the vicinity of specialized words. Compared to the other two subject matter passages, there were more mis-cues produced in the science passage and these mis-cues resulted in a greater loss of comprehension than was evident in the others.

In the first paragraph, some confusion was evident over the shift in tenses between the present and future and also in the use of an ellipsed form of the future--"take place" for "can take place." Confusion was caused by the close proximity of the terms "reaction" and "reacting." The change of idea at the end of the paragraph was not clear and caused some confusion.

In the second paragraph, confusion was caused by the introduction of the term "particle" as a synonym for the term "molecule" which was used throughout the first paragraph. The question in the third sentence seems to cause confusion over the purpose of the question within the context. The students seemed confused over the identification of supporting details in the last three sentences. There was a general substitution and reversal of words in the last sentence.

In the third paragraph, most of the confusion seemed to be caused by the arithmetic notations and the use of abbreviations.

In constructing the revised science passage, there was an attempt to eliminate the confusing sections by providing consistency in tense and creating more natural syntactical patterns. Wherever possible, consistency in the technical vocabulary was maintained. It should be noted that even though the science passage had the greatest number of mis-cues, the least amount of revision was done on it. In the

opinion of the subject consultant, the revision "wants" revision. This was a subjective opinion based primarily on a "feel" for language. However, no further revision was attempted for it was felt a major restructuring would obviate the purpose of this study. It was the investigators intent to determine the feasability and practicality of utilizing the oral reading responses as a means for revisions. It is quite possible that the syntactical patterns and the concepts of the passage are difficult for ninth grade students; however, full restructuring of the passage would have introduced the problem of ensuring passage equivalency.

FINDINGS OF THE EXPERIMENTAL PHASE

Reliability Estimations

The reliabilities of the six readability tests were estimated by a split-half technique on the exact response scores. The resulting coefficients were corrected by the Spearman-Brown Prophecy Formula. The corrected correlation coefficients ranged from .66 to .87. Table 10 summarizes the results of the reliability tests.

Table 10. Reliability Coefficients of the Exact Response Cloze Readability Tests of the Original and Revised Subject Matter Passages.

Source	Split-half Reliability Coefficients	Corrected Reliability Coefficients
Original		
Social Studies	.63	.76
English	.49	.66
Science	.62	.77
Revised		
Social Studies	.70	.82
English	.79	.88
Science	.77	.87

It is interesting to note that even though the cloze readability texts were constructed on the original passages and imposed on the revised passages, the cloze tests on the latter appeared to be more reliable measures of readability.

Because the coefficients of reliability on the original English passage was decidedly lower than those of the other passages, a coefficient of reliability was computed on that cloze test using the synonym response scores. The split-half reliability coefficient was .73 and the corrected coefficient of reliability was .84. One reason the use of synonym responses might have increased the reliability of the cloze readability is that the variability of the scores was increased. (See Table 11.)

Table 11. Coefficients of Reliability of the Exact and Synonym Response Cloze Readability Tests of the Original English Passage.

Form	Mean	S.D.	Split-half Reliability Coefficient	Corrected Reliability Coefficient
Exact --odd	7.0	2.3	.49	.66
even	8.5	2.8		
Synonym --odd	11.9	3.7	.73	.84
even	13.0	3.7		

Analysis of Readability Scores

Two analyses of variance were computed. The first analysis compared the exact cloze responses on the original and revised subject matter passages. The second analysis compared the synonym responses on the cloze readability tests. Tables 12 and 14 contain the cell means for the two analyses, and Tables 13 and 15 contain summaries of the analyses of variance. Table 16 summarizes the correlation coefficients computed between the subjects' exact cloze scores and their synonyms response cloze scores, and those computed between the subjects' exact response cloze scores and their Diagnostic Reading Tests scores. All of these correlations appear high.

Analysis of main effects. The main effects measured in the analyses of variance were (1) the form of the passage--original or revised, and (2) the subject matter of the passage--social studies, English, or science.

1. Form of the passage. The analyses of variance for the exact response as well as the synonym response cloze readability scores indicated that the form of the passage did not have a significant effect.

2. Subject matter of passage. The analysis of variance for the exact response as well as the synonym response cloze readability tests indicated that the subject matter of the passage had a significant

effect ($p < .01$) regardless of the form of the test. An examination of the cell means revealed that both the original and revised English passages were significantly more readable than either of the social studies or science passages.

Table 12. Cell Means for Analysis of Variance Using Exact Response Cloze Scores.

Form	Subject Matter		
	Social Studies	English	Science
Original	9.69	15.56	10.19
Revised	9.94	17.31	11.31

Table 13. Analysis of Variance of Exact Response Cloze Readability Scores ($n = 96$).

Source	Sum of Squares	d.f.	Mean Squares	F Ratio
Form	26.04	1	26.04	2.73
Subject Matter	822.58	2	411.29	43.16**
Form X Subject	9.09	2	4.54	.476
Within Treatment	857.71	90	9.53	
Total	2438.29	95		

** $p < .01$

Table 14. Cell Means for Analysis of Variance Using Synonym Response Cloze Scores.

Form	Subject Matter		
	Social Studies	English	Science
Original	14.13	24.94	14.38
Revised	15.63	26.00	14.00

Table 15. Analysis of Variance of Synonyms Response Cloze Readability Scores (n = 96).

Source	Sum of Squares	d.f.	Mean Squares	F Ratio
Form	12.76	1	12.76	.250
Subject Matter	2559.65	2	1279.83	25.124**
Form X Subject	15.39	2	7.70	.151
Within Treatment	4584.19	90	50.94	
Total	7171.99	95		

**$p < .01$

Table 16. Correlation Coefficients Between Exact and Synonym Response Cloze Scores and Exact Response Cloze Scores and Diagnostic Reading Test Scores.

Group	Correlation	
	Exact/Synonym	Exact/DRT
Original		
Social Studies	.96	.75
English	.89	.68
Science	.91	.60
Revised		
Social Studies	.88	.36
English	.96	.81
Science	.98	.76

Hypothesis. The research hypothesis was tested by the analysis of variance already reported. The prediction that the mean readability scores for the revised subject matter passages would be significantly higher than the mean readability scores for the original passages was not verified.

DISCUSSION OF THE FINDINGS

The purpose of this section is to examine the findings of this study and to offer tentative explanations for their occurrence.

Two basic assumptions underlying this study were that (1) the oral reading responses of high school students could be used to identify confusing and/or ambiguous portions of the text, and that (2) those responses could be used as a basis for revising the text to make it more readable. The first assumption was confirmed; the second was not confirmed by this research.

The findings of the descriptive phase of the present study are consistent with previous research utilizing mis-cue analysis as a means of evaluating and gaining insight into the reader's interaction with the written text.

However, the practicality of utilizing these insights as a basis for creating alternate forms which are more readable--that is, which contain less confusing and/or ambiguous portions--has not been established. There is evidence that (1) the high reading ability group in the descriptive phase sub-sample was able to read each of the original subject matter passages with greater understanding than did the other reading ability groups; and that (2) there are high correlations between exact response cloze readability scores and reading ability. The ability to cognitively process the ideas in the subject matter passages seems to be related to general reading ability.

A technique suggested by Bormuth[1] for analyzing cloze results indicates that all the passages except the English passages scored by the synonym responses were below the mean instructional reading level of the experimental phase sample. It is possible that no significant results were obtained because the particular revision used still was too difficult for most of the students.

A question raised by Hittleman[2] about the possibility of creating

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[1] Bormuth, John R., "The Cloze Readability Procedure," Readability in 1968. John R. Bormuth (Ed.), NCTE, p. 46.

[2] Hittleman, Daniel R., "The Readability of Subject Matter Material Re-written on the Basis of Students' Oral Reading Miscues." (Unpublished Doctor's dissertation, Hofstra U., 1971) p. 123.

a more readable form which is not evident because the cloze readability test might have a difficulty factor of its own still has not been answered. The difficulty factor of the cloze test might mask the fact that an alternate form is more readable. In the Hittleman study, the use of the every "nth" word cloze procedure was questioned for use with alternate forms of the same content. In the present study only content words were deleted and the same words were deleted from both forms of each subject matter passage. Both the exact and synonym response cloze scores indicate that the two English passages were the most readable of the original passages, whereas the original social studies passage was identified as the most readable--it resulted in fewer mis-cues causing comprehension loss. Bormuth[3] has stated that the cloze readability procedure does not confuse the measurement of passage difficulty by injecting an extraneous reading task into the process. The present study, together with the Hittleman study, raises a question about Bormuth's statement. It might have more validity when the purpose is to distinguish among passages not equivalent in content. The possibility exists that the analysis of mis-cues and the cloze readability procedure might be measuring different aspects of "understandability". Further research is needed in this area to determine whether the cloze technique and miscue analysis are responsive in differing degrees to the syntactic and semantic structures of the passage.

The high correlations between the exact and synonym response cloze scores seem to indicate that it is unnecessary to use anything but exact responses with the cloze procedure tests. Any increased reliability that is gained can probably be obtained more practically by increasing the number of deleted items on the test. A comparison of the F scores from the two analyses of variance also gives evidence of the increased variability of the scores when synonym responses are counted as correct. These findings seem to be consistent with previous research utilizing the cloze procedure.[4]

In summary, there is no specific evidence that the revised passeges were made more readable. One reason might be that the concept loads of the passages were so high that simple revisions of the passages did not bring them within the readable range of these particular students.

LIMITATIONS OF THE FINDINGS

Any generalizations which can be made from this study must be considered as highly tentative and are not applicable to any population other than that of this study.

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[3]Bormuth, John R., "New Developments in Readability Research," Readability in 1968. John R. Bormuth (Ed.), NCTE, 1968, p. 2.

[4]Bormuth, "Cloze", p. 43.

Because of the inconclusiveness of the statistical findings from the experimental phase of this study, the revised passages created by the investigators were never validated. There is no way, therefore, to know whether the obtained results are due to no revision of the original passages being more readable or whether just this particular revision was not more readable than the original.

Since no specific readability formula was used as the criterion for change, other investigators might have created different revised passages. A specific purpose was set for the evaluation of miscues with the assistance of the subject matter consultants. Different purposes could be justifiably assigned by different consultants. As a result, different revisions could be written as emphasis is shifted to revised portions of the text recognized as confusing or ambiguous.

Chapter 5

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

This study has been an attempt to analyze the difficulties some ninth grade students encountered in reading subject matter materials, and then to restructure and rewrite the materials so they would be easier for other ninth grade students to read.

The study was based on the assumption that reading is a psycholinguistic process in which the reader, by interacting with the written material, tries to reconstruct the writer's meaning. This theory of reading as a psycholinguistic process is based upon a generative-transformational theory of grammar in which it is hypothesized that ideas can be presented in more than one syntactical pattern.

The assumption is made that the reader's accuracy in processing language cues may be demonstrated through oral reading which shows no deviations from the printed page. When deviations occur between the reader's oral response and what was expected, the phenomena are called "mis-cues."

This study was concerned with mis-cues which resulted in grammatical re-transformations. Re-transformations, having a relationship to the concept of grammatical transformations, are any changes in the syntax which occur to a textual sequence during oral reading.

Research into readability differences between two forms of the same basic content has progressed from the use of a simple index of familiar words and sentence length to the search for psycholinguistic factors which contain relationships between thought processes and language. The present study was designed to provide additional insights into: (1) the nature of the reading process, (2) the concept of readability, and (3) the preparation of instructional materials.

The specific purpose of the study was to investigate social studies, English and science text, whether revised on the basis of secondary school students' oral reading mis-cues that result in grammatical re-transformations, had greater readability than the original texts for other secondary school students.

The study was undertaken in the Junior High Schools of the Farmingdale, Long Island, N. Y. Public Schools. The descriptive phase sample consisted of 217 ninth grade students. The Diagnostic Reading Test was administered and, based upon their scores, the subjects were assigned to one of three ability level groups.

A stratified sub-sample of 23 subjects was selected to orally read the subject matter passages. The readings were tape recorded. The mis-cues were transcribed onto worksheets and analyzed according to the procedures of the Reading Miscue Inventory, an instrument based upon the theory of reading as a psycholinguistic process and developed

to examine the possible psycholinguistic causes of oral reading responses which deviated from the expected responses of the text.

Using the analysis of the mis-cues as a basis for the changes, revised passages were written. After subject matter specialists verified the content equivalency of the original and revised passages, the original and revised passages were made into cloze readability tests by deleting 50 content words. The readability test forms were duplicated and combined into a booklet with the same cover sheet.

A group of 96 ninth graders matched to the descriptive phase sample on Diagnostic Reading Test scores comprised the experimental phase sample. Each of the subjects was randomly assigned to take one of the readability tests.

The research hypothesis was tested by an analysis of variance. The hypothesis predicting a lower level of readability for the revised passage was not verified. Since the revised passages were not validated through the study, all generalizations which can be made from the experimental phase of this study must be considered as highly tentative and are not applicable to any population other than that of this study.

CONCLUSIONS

1. The oral reading of the ninth grade students in this study demonstrated that they attempted to readjust the syntactical patterns of the subject matter passages in order to gain meaning.

Their performance provides additional support for a theory of reading postulating an active interaction between the reader and the written material. Mis-cues were not haphazard, but revealed the reading strategies of the students as they manipulated the graphophonemic, syntactic, and semantic cues during oral reading.

2. The analysis of mis-cues from the reading of the subject matter passages revealed portions which were confusing and/or ambiguous. The analysis also provided some insight into whether or not the difficulties were due to the strangeness of the topic, to the underlying meanings (deep structures) of the topic, or to the author's style of writing.

IMPLICATIONS

Nature of the Reading Process

The findings of the descriptive phase of this study give additional evidence that reading is a psycholinguistic process. Mis-cues exist at the secondary level, and seem to represent strategies for decoding meaning. The Reading Miscue Inventory appears to be a viable instrument for analyzing mis-cues, as long as adjustments are made to account for measuring the extent of comprehension loss depending upon the reader's purpose, the teacher's purpose, or the scorer's purpose.

Concept of Readability

Much recent work has been undertaken to explore the linguistic nature of readability. Researchers have progressed in their attempts to explain the relationships between thought processes and language. However, psycholinguistic research into the nature of readability is still in its infancy. Though much is known about limited aspects of readability, no definite answers have been provided to explain what readability is or how it is measured. This study has suggested a theoretical implication of the emerging concept of readability.

Preparation of Instructional Materials

This study indicated that readers of different ability levels may be processing the different subject matter materials with different reading strategies. The evidence of high correlations between the readability and reading ability scores points out that high ability readers may be processing subject matter material more proficiently than low ability readers. It lends support to the position that authors and publishers might find it advantageous to seek ways to construct materials so that the less able readers can decode meaning more easily.

Creators of instructional materials must carefully examine the extraneous concepts introduced in the materials. Although their inclusion might be justified in that they make the reading more interesting, without proper identification as such, they might be interpreted by the reader as important to the main idea of passage and cause him to misinterpret the passage.

FUTURE RESEARCH

Researchers should explore further how the interrelationships among the reader, author, and topic all affect readability. Some measure of the effect upon readability of the concept load of a passage as well as the effect of differing degrees of concept loads within similar syntactic structures needs to be explored. Also, a psycho-emotional factor might need to be considered. We know very little about the effect upon the reading process of a reader's perception of how well he understands what he is reading at a given time and the adjustments he makes because of this perception.

Taken in this light, readability might not be an absolute entity inherent within a written passage and measured by a scale or index, but might be relative to a "moment" at which time the reader's emotional, cognitive, and linguistic backgrounds interact with each other, with the topic, with proposed purposes for doing the reading, and with the author's choice of semantic and syntactic structures.

Because readability seems to be a comprehensive term for a conglomerate of capacities, processes, and interactions within, between, and among the author, the passage content, the written product, and the reader, future research should focus on the development of an operational definition of readability. The present study used a definition (the cloze procedure), considered the best presently available, which appears to measure an end result, may not measure the functioning of the elements leading to the result and may have a difficulty level of its own separate and apart from the material upon which it is used. An operational definition of readability would develop from identification of the elements constituting readability, for example, the suggested elements relative to the "moment" referred to above, and evaluation of those elements through quantitative measurements. Quite possibly, different "readabilities" would be revealed by different configurations of the resultant measurements.

Additional research is needed to establish how to revise syntactically and semantically confusing passages identified through field testing in a representative sample of the intended users of the material. Research is needed to determine whether the revisions should be based on students' oral reading patterns, on some other language patterns of the students, or on characteristics of language and rhetoric of authors. If this is not feasable the field testing procedure might at least identify passages that need to be completely re-written because the semantic load is too great or the language style too complex for the readers to understand.

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APPENDIXES

APPENDIX A

The Original Passages

Passage #1, the Social Studies Passage

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Passage #2, the English Passage

From: the Roberts English Series: A Linguistic Program, Complete Course by Paul Roberts, copyright © 1967 by Harcourt Brace Jovanovich, Inc. All rights reserved. Reprinted by permission of the publisher.

Passage #3, the Science Passage

From: the Patterns and Processes of Science, Laboratory Text #3 by Fred Weisbruck and others, copyright © 1968 by D. C. Heath, Inc. All rights reserved. Reprinted by permission of the publisher.

Passage # 1, The Social Studies Passage

To place their national economy on a firm footing, governments in New Africa are now trying to do many things at the same time. They are enlarging ports, building roads and railroads, training technicians, educating youth, discovering new resources, and establishing industries. But this work will take years. There are just not enough skilled people to go around. A technological society requires many skilled workers. In New Africa every scientist, every engineer, and every manager knows he can even make more money by going to Europe or America. An exceptional student is sent overseas for further education. He may never return to his homeland. The opportunities for research, travel, and financial gain are great. This problem, called the "brain drain," shows how difficult it is for a country to develop.

Tampering with a way of life involves frightening risks. The things that have held a society together for centuries may be lost unless the new way of life takes into proper consideration the traditions and attitudes of the people. The technological progress may not be worth the price. From the purely practical point of view of many African leaders, cultural change in New Africa must be speeded up. Take land ownership, for example. In many regions land is given out by the chiefs, sometimes for life, but more often on a year-to-year basis. Yet a person without clear title to a piece of property is not very likely to improve it. He will not fill a gully to stop erosion and he will not plant grasses. Instead, he will tend to follow a semi-nomadic existence, "mining" the soil by planting crops that will grow easily. At the first sign of soil exhaustion he will move on. Farmers must be given ownership somehow if this cycle is to be broken.

Agricultural production must be improved in many areas. As it is often really gardening. It generally takes two men working the land to produce enough food for one man in the city. An obvious solution calls for fewer farmers and more farm machinery. Care must be taken in introducing such a program, however. An agricultural revolution that forces people off the land would be very bad unless at the same time an industrial revolution occurs creating jobs in the city.

Passage #2, the English Passage

What do we learn when we learn a language? One's first reply might be "Words, obviously." Of course it is true that learning a language is partly a matter of learning words and what they mean. When we learned our native language, we somehow got onto the meaning of all sorts of different words, from placenames to prepositions. We learned that stand was different from sit, and in from out, and brother from sister.

But knowing words is not the only thing to knowing a language, nor even the most important. One might know the meaning of all the words in a large English dictionary and still be quite unable to speak English. What one must also know is how to assemble words in sentences and how to pronounce the sentences. Grammar is the particular knowledge that enables us to do this.

A language is in fact a very complicated mechanism for the production of sentences. As children, we learn the mechanism for the production of sentences in our native language -- for the most part quite unconscious of the fact that we are doing so. At a very early age, we begin figuring out, from the random utterances that we hear, the rules of English grammar -- how to ask questions, how to request things, how to say no, how to make past tenses and plurals, how to make certain ideas depend on others. To say that a person speaks English is to say that he has built into him, as it were, a set of rules which enable him to produce, or generate, English sentences as he needs them. The rules allow him to come out as occasion demands with just those sentences that will serve him -- that will permit him to buy a bar of candy, tell a stranger how to get to Fifth and Main, protest against not being allowed to look at television, plan a picnic, describe the causes of the Revolutionary War. They also enable him to understand the sentences of another person speaking the language.

When we talk to each other in our native language, we are not at all conscious of grammatical rules. We scarcely know that we have used here a subject, there a past tense, there a relative clause. Yet all the time we are working with a grammar, a set of rules for sentence production which we acquired simply by being born into an English-speaking community.

Passage #3, the Science Passage

In order that a chemical reaction take place, there must be collisions between molecules. It is necessary that molecules and atoms come into contact with each other so that an exchange can take place and new molecules be formed. The smaller the bits of material and the better they are mixed, the more rapid and complete the reaction will be. The best possible mixture would be one in which the molecules are free to move easily. This condition exists when the reacting substances are liquids and gases. Since most materials require a very high temperature to change them to gases, it is not convenient (and sometimes even impossible) to work with gas reactions in the laboratory.

Since gases are too difficult to work with, the next best condition for a chemical reaction to take place is between particles of a liquid. Particles of liquids are free to move about and collide with other particles. But what about solids that we wish to react with each other in the laboratory? It is possible to attain this freedom of movement in particles of a solid by dissolving the solid in water. Water separates and frees the particles of a solid so that they can move around and collide with other molecules. Whenever possible, therefore, the chemist uses a water solution of the solid when he wishes to bring about a chemical reaction. Furthermore, solutions are easy to handle and can be measured very accurately without using a balance. As a general rule high temperatures are not necessary in order that reactions between solutions take place. This is another advantage of using solids in the form of solutions. This was why you dissolved silver nitrate in water in your last experiment. It then reacted immediately with copper.

There is another advantage in using solutions. This is the ease of making an indirect measurement of the mass of very small amounts of materials. Suppose a liter (1000 ml) of a solution of salt contains 1.0 g of salt. One milliliter of this solution (1.0ml) will contain 1/1000 of the original amount of salt, or 0.001 g. If we know the mass of material dissolved in a certain volume of water we can calculate the mass of the material contained in a single drop of the solution.

APPENDIX B

The Revised Passages

Social Studies Passage -- revised

The governments in New Africa are now trying to do many things at the same time in order to make their national economies stable. They are building roads and railroads, enlarging ports, educating youth, training technicians discovering new resources, and establishing industries. But this work will take years. There are not enough skilled people to go around because of a problem called the "brain drain." In New Africa, every scientist, every engineer, and every manager knows he can make more money by going to Europe or America. Also, when an exceptional student goes overseas for further education, he may never return to his homeland. He realizes that opportunities for research, travel, and financial gain are greater outside New Africa. This problem shows how difficult it is for the countries to develop into technological societies without skilled workers.

When African leaders try to tamper with an old way of life, it involves frightening risks. The new way of life must take into proper consideration the traditions and attitudes of the people or the things that have held a society together for centuries may be lost. The technological progress that is achieved may not be worth the price of what is lost. However, from a purely practical point of view, many African leaders believe cultural change in New Africa must be speeded up. For example, take the way land is owned. In many regions land is given out by the chiefs, sometimes for life, but more often on a year-to-year basis. Yet a person who does not own a piece of property is not very likely to improve it. He will not fill a gully to stop erosion, and he will not plant grass. Instead, he will tend to follow a semi-nomadic life and only plant crops that will grow easily. Then at the first sign of soil exhaustion, he will move on. The African leaders must give farmers ownership somehow if this cycle is to be broken.

The leaders must find a way to improve agricultural production in many areas because it is often nothing more than gardening. Two men must work the land to produce enough food for one man in the city. An obvious solution calls for fewer farmers and more farm machinery. However, care must be taken when such a program is introduced. A change in agricultural production that forces people to leave their land would be very bad unless at the same time a change in industrial production occurs to create jobs for them in the city.

English Passage -- revised

What do we learn when we learn a language? Our first reply might be "words, obviously." Of course it is true that learning a language is partly a matter of learning words and their meanings. When we learn our native language, we somehow get the meaning of all sorts of different words. We learn that STAND is different from SIT, and IN from OUT, and BROTHER from SISTER.

But knowing words is not the only thing to knowing a language; it is not even the most important. We might know the meaning of all the words in the dictionary and still be quite unable to speak English. We must also know how to assemble words into sentences and how to say the sentences. Grammar is the particular knowledge that enables us to do this.

A language is a very complicated process for the production of sentences. As children, we usually learn how to group words together in our native language without being aware of the fact that we are learning to produce sentences. At a very early age, we begin figuring out, from the random speech that we hear, the rules of English grammar. We learn rules such as how to ask questions, how to request things, how to say no, how to make plurals and past tenses, and how to make certain ideas depend on others. When we say that a person speaks English, we mean that he has built into him a set of rules which enable him to produce English sentences whenever he needs them. For example, the rules allow him to say exactly the sentences he needs as an occasion demands. He produces sentences that permit him to buy a bar of candy, to tell a stranger how to get to Fifth and Main, to protest against not being allowed to look at television, to plan a picnic, and to describe the causes of the Revolutionary War. The rules also enable him to understand the sentences of another person speaking the language.

When we talk to each other in our native language, we are not at all aware that we are using rules of grammar. We do not often know that we have used a subject, or a past tense, or a relative clause. Yet all the time we are working with rules of grammar. We acquire these rules for producing sentences simply by being born into the English-speaking community.

Science Passage -- revised

In order that a chemical reaction takes place, there must be a collision between molecules. It is necessary that the molecules and atoms come in contact with each other so an exchange can take place and new molecules can be formed. The reaction is more rapid and complete if the bits of material are small and they are well mixed. The best possible mixture is one in which the molecules are free to move easily. This condition exists when liquids and gases are the reacting substances. However, it is not easy (and sometimes even impossible) to work with gas reactions in the laboratory since most materials require a very high temperature to change them into gases.

Since gases are too difficult to work with, the next best condition to get a chemical reaction is between molecules of a liquid. Molecules of a liquid are free to move about and collide with other molecules. If we wish solids to react with other solids in the laboratory, we can get this freedom of movement in the molecules of a solid by dissolving the solid in water. Water separates and frees the molecules of the solid so they can move around and collide with the other molecules. Whenever possible, therefore, the chemist uses a water solution of the solid when he wishes to bring about a chemical reaction. Furthermore, the solutions are easy to handle and can be measured very accurately without using a balance. Another advantage of using solids in the form of solutions is that high temperatures are not needed in order for the reactions between solutions to take place. This was why you dissolved silver nitrate in water in your last experiment. It reacted immediately with copper.

Still another advantage in using solutions is that it is easy to make an indirect measurement of the mass of a very small amount of material. For example, suppose a liter (1000 milliliters) of a salt solution has in it 1 gram of salt. One milliliter of this solution (1 milliliter) has 1/1000 of the original amount of salt, or 0.001 grams. If we know the mass of material dissolved in a certain volume of water we can figure out the mass of material that is in a single drop of the solution.

APPENDIX C

The Reading Miscue Inventory

Outline

READING MISCUE INVENTORY

by Carolyn Burke
Yetta Goodman

1. DIALECT. IS A DIALECT VARIATION INVOLVED IN THE MISCUE?

   Mark Y if applicable; otherwise leave blank.

2. INTONATION. IS A SHIFT IN INTONATION INVOLVED IN THE MISCUE?

   Mark Y if applicable; otherwise leave blank.

3. GRAPHIC SIMILARITY. HOW MUCH DOES THE MISCUE LOOK LIKE WHAT WAS EXPECTED?*

   Y A high degree of graphic similarity exists between the miscue and the text.

   P Some degree of graphic similarity exists between the miscue and the text.

   N A graphic similarity does not exist between the miscue and the text.

   *If the miscue is an omission or insertion, this category is not marked. Also, if the miscue involves more than one word, this category is not marked.

4. SOUND SIMILARITY. HOW MUCH DOES THE MISCUE SOUND LIKE WHAT WAS EXPECTED?*

   Y A high degree of sound similarity exists between the miscue and what was expected.

   P Some degree of sound similarity exists between the miscue and what was expected.

   N A sound similarity does not exist between the miscue and what was expected.

   *If the miscue is an omission or insertion, this category is not marked. Also, if the miscue involves more than one word, this category is not marked.

5. GRAMMATICAL FUNCTION. IS THE GRAMMATICAL FUNCTION OF THE MISCUE THE SAME AS THE GRAMMATICAL FUNCTION OF THE TEXT?*

   Y The grammatical function of the two is identical.

   P It is not possible to determine grammatical function.

   N The grammatical functions of the two differ.

   *If the miscue is an omission or insertion, this is not marked. Also, if the miscue involves more than one word, this question is not marked.

6. CORRECTION. IS THE MISCUE CORRECTED?

Y The miscue is corrected.

P There is an unsuccessful attempt at correction. Or a correct response is abandoned.

N The miscue is not corrected.

7. GRAMMATICAL ACCEPTABILITY. DOES THE MISCUE RESULT IN A STRUCTURE WHICH IS GRAMMATICALLY ACCEPTABLE WITHIN THE READER'S DIALECT?

Y The miscue is grammatically acceptable within both the sentence and the story as a whole.

P The miscue is grammatically acceptable only with what comes before or after it. Or the miscue is acceptable only within the sentence.

N The miscue is not grammatically acceptable.

8. MEANING ACCEPTABILITY. DOES THE MISCUE RESULT IN MEANING WHICH IS ACCEPTABLE WITHIN THE READER'S DIALECT?

Y The miscue results in meaning which is acceptable within the story.

P The miscue results in meaning which is acceptable only with what comes before or after it. Or the miscue is acceptable only within the story.

N The miscue does not result in meaning acceptability.

9. MEANING CHANGE. DOES THE MISCUE RESULT IN A CHANGE OF MEANING.

Y An extensive change in meaning is involved.

P Some change in meaning is involved.

N No change in meaning is involved.

READING MISCUE INVENTORY CODING SHEET

Carolyn L. Burke and Yetta M. Goodman 1972

Reader	Date	Selection
Teacher	Class	School

QUESTION TOTAL	COLUMN TOTAL PERCENTAGE			
			Miscue Number	
			Reader	
			Text	
			DIALECT 1	
			INTONATION 2	
			Y p N	GRAPHIC SIMILARITY 3
			Y p N	SOUND SIMILARITY 4
			Y p N	GRAMMATICAL FUNCTION 5
PATTERN TOTAL	COLUMN TOTAL PERCENTAGE		CORRECTION 6	
			GRAMMATICAL ACCEPTABILITY 7	
			SEMANTIC ACCEPTABILITY 8	
			MEANING CHANGE 9	
			No Loss Partial Loss Loss	COMPREHENSION
			Strength Partial Strength Weakness Overcorrection	GRAMMATICAL RELATIONSHIPS

APPENDIX D

Examples of Mis-cues

A distinction should be made between mis-cues which cause re-transformations and those which do not. When the observed response in no way changes the grammatical structure of the text, no re-transformation has occurred.

An example of a mis-cue without a re-transformation is:

E.R.: There is another advantage...

O.R.: There is an advantage...

However,

> A reader works with already generated and transformed grammatical structures. His mis-cues reflect his anticipation of the deep structure, surface structure and the meaning with which he is dealing. It is possible for a miscue to cause a change in either or both.
>
> Syntactic changes which the reader institutes can occur at either the deep or surface structure level. In this sense, he recreates the generative process of the author and transforms the material. [In this study, the phenomenon is called a 'retransformation'.] *

An example of a mis-cue resulting in a re-transformation is:

E.R.: Water separates and frees...

O.R.: What separates and frees...

Following are examples of mis-cues which illustrate the questions asked about each mis-cue. In reality it is rare for a mis-cue to involve only a single category.

INTONATION

E.R.: in many areas. As it is....

O.R.: in many areas as it is.

GRAPHIC SIMILARITY

A high degree:

E.R.: going

O.R.: doing

---

*Kenneth S. Goodman and Carolyn L. Burke, "Manual for the Use of Miscue Analysis," Preliminary Edition (Detroit: Wayne State University, September, 1970), p. 27.

Some similarity

E.R.: footing

O.R.: footage

No similarity

E.R.: in

O.R.: to

SOUND SIMILARITY

A high degree

E.R.: existence

O.R.: /exilence/

Some similarity

E.R.: price

O.R.: piece

No similarity

E.R.: on

O.R.: than

GRAMMATICAL FUNCTION

Same

E.R.: the progress may not be...

O.R.: the process may not be...

Different

E.R.: a language is in fact...

O.R.: a large is in fact....

Cannot tell

E.R.: the next best condition

O.R.: the next base condition

GRAMMATICAL ACCEPTABILITY

Acceptable within sentence and entire passage

E.R.: from the purely practical point of view...

O.R.: from the pure point of view...

Acceptable only within sentence

E.R.: we somehow got onto the meaning...

O.R.: we somehow go into the meaning

Not acceptable in sentence or passage

E.R.: is not very likely to improve....

O.R.: is not very like to improve...

SEMANTIC ACCEPTABILITY

Acceptable within sentence and passage

E.R.: how to pronounce the sentences...

O.R.: how to pronounce those sentences...

Acceptable only within sentence.

E.R.: We learned that...

O.R.: we learn that...

Not acceptable in sentences or passage.

E.R.: ...and/IN from...

O.R.: ...and front of OUT...

MEANING CHANGE

Extensive

E.R.: for the production of sentences in our native....

O.R.: for the production of sentences is our native...

Minimum

E.R.: When we learned our....

O.R.: When we learn our...

No change

E.R.: describe the causes...

O.R.: describing the causes...

APPENDIX E

Samples of Mis-cues

from the Study

SAMPLES OF MIS-CUES

The Social Studies Passage

E.R.: This problem, called the "brain drain," shows how difficult it is for a country to develop.

O.R.: High Ability Group

... shows how different...
... for the country...

Low Ability Group

..."brain gain."...
...how different...

Average Ability Group

...shows how differé...
...the "brain train,"...
...shows how different...
...called brain drain...
...shows the difficult...

E.R.: Agricultural production must be improved in many areas. As it is, it is often really gardening. It generally takes two men working the land to produce enough food for one man in the city.

O.R.: High Ability Group

...for one more in the city.
In generally...
...production is being improved...

Low Ability Group

...regularly gardening...
A general takes...
It gradually takes...

Average Ability Group

Agricultural products...
In generally...
...working the hand to...
Agriculture....
...for one man. In the city an obvious...

The English Passage

E.R.: When we learned our native language, we somehow got onto the meaning of all sorts of different words, from place-names to prepositions.

O.R.:

High Ability Group

...got into...
When we learn...

Average Ability Group

...from placements to...
What we learn our...
...got out the meaning...
We learn our...
...our language...

Low Ability Group

...go into The...
When we learn our...
...from place to names...
...of sorts of...
...of difference words...
...propositions...

E.R.: To say that a person speaks English is to say that he has built into him, as it were, a set of rules which enable him to produce, or generate, English sentences as he needs them.

O.R.:

High Ability Group

...he also has built...
...he builds into...
...enables him...

Low Ability Group

...into himself...
...as it in were...
...sentences are by he...
...or generate. English sentences...
...English sentences. As...

Average Ability Group

to say what...
...he was built into...
...were, set rules which...
...of rules to enable...
...him, or it were...
...of rules enable...

E.R.: This condition exists when the reacting substances are liquids and gases.

O.R.: High Ability Group

...When the reaching...
...When a reaction...

Low Ability Group

...The reacting substance is...
The conditions exist...
...The reaction substances ...

Average Ability Group

...The reacting substance ...
...When the reaction...
The conditions exist...
...When a reacting...
The condition exists...
...exists between reacting...
.../sustances/...
...exists where the reacting...

E.R.: But what about solids that we wish to react with each other in the laboratory?

O.R.: High Ability Group

...With other in...
...in their laboratory.
...about the solids...

Low Ability Group

But what about solids?
They we wish...

...That we use to react...
...other and the laboratory.

Average Ability Group

But the other solids...
...in a laboratory.
...about the solids...
...about solids they we wish...

APPENDIX F

The Readability Tests

Student's Name _____ Form _____

INSTRUCTIONS

At the bottom of this page is a sample of the test you will take. The test was made by copying a passage from a book. Some of the words have been left out of the passage, and blank spaces with numbers were put in their place.

Your job will be to guess what word has been left out of each space and to write that word on the answer sheet next to the appropriate number.

It will help you in taking the test if you remember these things:

1. Write only one word for each blank.
2. Try to write a word for each blank. Don't be afraid to guess.
3. You may skip hard blanks and come back to them when you have finished.
4. All of the blanks can be answered with ordinary words.
5. A word may be spelled wrong as long as we can tell what word you meant.
6. Your mark on this test will not count toward your grade in any of your classes.
7. Write neatly.

SAMPLE TEST

Below is a sample of the test. In the answer space, write the word you think was taken out of the passage for each blank. The first two are done for you.

The world is different things to different people. To the farmer, the world __1__ people who get hungry __2__ need to eat. To __3__ farmers, it's a __4__ of breakfast, lunch, and __5__; a world of milk __6__ babies and meat and __7__ for adults.

1. *is* _____
2. *and* _____
3. _____
4. _____
5. _____
6. _____
7. _____

Answers: 3. some 4. world 5. dinner 6. for 7. potatoes

100 - 0

To place their national economy on a firm footing, governments in New Africa are now trying to do many things at the same time. They are enlarging ports, ___1___ roads and railroads, training ___2___, educating youth, discovering new ___3___ and establishing industries. But this ___4___ will take years. There are just not enough skilled ___5___ to go around. A ___6___ society requires many skilled ___7___. In New Africa every ___8___, every engineer, and every ___9___ knows he can even make more ___10___ by going to ___11___ or America. An exceptional ___12___ is sent overseas for further ___13___. He may never return to his ___14___. The opportunities for ___15___, travel, and financial ___16___ are great. This problem, called the "___17___-drain," shows how difficult it is for a ___18___ to develop.

Tampering with a ___19___ of life involves ___20___ risks. The things that have ___21___ a society together for ___22___ may be lost unless the ___23___ way of life ___24___ into proper consideration the ___25___ and attitudes of the ___26___. The technological progress may not be ___27___ the price. From the purely ___28___ point of view of many ___29___ leaders, cultural change in ___30___ Africa must be speeded up. ___31___ land ownership, for example. In many ___32___ land is given out by the ___33___, sometimes for ___34___, but more often on a ___35___-to-year basis. Yet a ___36___ without clear title to a ___37___ of property is not very likely to ___38___ it. He will not ___39___ a gully to stop ___40___ and he will not ___41___ grasses. Instead, he will ___42___ to follow a semi-___43___ existence, "mining" the soil by ___44___ crops that will ___45___ easily. At the first sign of ___46___ exhaustion he will move on. ___47___ must be given ___48___ somehow if this ___49___ is to be broken.

Agricultural ___50___ must be improved in many areas. As it is, it is often really gardening. It generally takes two men working the land to produce enough food for one man in the city. An obvious solution calls for fewer farmers and more farm machinery. Care must be taken in introducing such a program, however. An agricultural revolution that forces people off the land would be very bad unless at the same time an industrial revolution occurs creating jobs in the city.

100 - H

The governments in New Africa are now trying to do many things at the same time in order to make their national economies stable. They are __1__ roads and railroads, enlarging ports, educating youth, training __2__, discovering new __3__, and establishing industries. But this __4__ will take years. There are not enough skilled __5__ to go around because of a problem called the "__6__-drain." In New Africa, every __7__, every engineer, and every __8__ knows he can make more __9__ by going to __10__ or America. Also, when an exceptional __11__ goes overseas for further __12__, he may never return to his __13__. He realizes that opportunities for __14__, travel, and financial __15__ are greater outside New Africa. This problem shows how difficult it is for the __16__ to develop into __17__ societies without skilled __18__.

When African leaders try to tamper with an old __19__ of life, it involves __20__ risks. The __21__ way of life must __22__ into proper consideration the __23__ and attitudes of the __24__ or the things that have __25__ a society together for __26__ may be lost. The technological progress that is achieved may not be __27__ the price of what is lost. However, from a purely __28__ point of view, many __29__ leaders believe cultural change in __30__ Africa must be speeded up. For example, __31__ the way land is owned. In many __32__ land is given out by the __33__, sometimes for __34__, but more often on a __35__-to-year basis. Yet a __36__ who does not own a __37__ of property is not very likely to __38__ it. He will not __39__ a gully to stop __40__, and he will not __41__ grass. Instead, he will __42__ to follow a semi-__43__ life and only __44__ crops that will __45__ easily. Then at the first sign of __46__ exhaustion, he will move on. The African leaders must give __47__ __48__ somehow if this __49__ is to be broken.

The leaders must find a way to improve agricultural __50__ in many areas because it is often nothing more than gardening. Two men must work the land to produce enough food for one man in the city. An obvious solution calls for fewer farmers and more farm machinery. However, care must be taken when such a program is introduced. A change in agricultural production that forces people to leave their land would be very bad unless at the same time a change in industrial production occurs to creat jobs for them in the city.

200 - 0

What do we learn when we learn a language? One's first reply might be "__1__, obviously." Of course it __2__ true that learning a __3__ is partly a matter of __4__ words and what they __5__. When we learn our __6__ language, we somehow got onto the __7__ of all sorts of __8__ words, from placenames to prepositions. We learned that STAND was __9__ from SIT, and IN from __10__, and BROTHER from SISTER.

But __11__ words is not the only __12__ to knowing a language, nor even the __13__ important. One might know the __14__ of all the words in a large English __15__ and still be quite unable to __16__ English. What one must also __17__ is how to assemble __18__ in sentences and how to __19__ the sentences. Grammar is the __20__ knowledge that enables us to __21__ this.

A language is in fact a very __22__ mechanism for the production of __23__. As children, we __24__ the mechanism for the production of sentences in our __25__ language -- for the most part quite __26__ of the fact that __27__ are doing so. At a very early __28__, we begin figuring out, from the __29__ utterances that we hear, the __30__ of English grammar -- how to __31__ questions, how to request __32__, how to say no, how to __33__ past tenses and plurals, __34__ to make certain ideas __35__ on others. To say that a __36__ speaks English is to say that he has __37__ into him, as it were, a __38__ of rules which enable him to __39__, or generate, English sentences as he __40__ them. The rules __41__ him to come out as __42__ demands with just those __43__ that will serve him -- that will __44__ him to buy a __45__ of candy, tell a __46__ how to get to __47__ and Main, protest against not being __48__ to look at television, __49__ a picnic, describe the __50__ of the Revolutionary War. They also enable him to understand the sentences of another person speaking the language.

When we talk to each other in our native language, we are not at all conscious of grammatical rules. We scarcely know that we have used here a subject, there a past tense, there a relative clause. Yet all the time we are working with a grammar, a set of rules for sentence production which we acquired simply by being born into an English-speaking community.

200 - R

What do we learn when we learn a language? Our first reply might be "__1__, obviously." Of course it __2__ true that learning a __3__ is partly a matter of __4__ words and their __5__. When we learn our __6__ language, we somehow get the __7__ of all sorts of __8__ words. We learn that STAND is __9__ from SIT, and IN from __10__, and BROTHER from SISTER.

But __11__ words is not the only __12__ to knowing a language; it is not even the __13__ important. We might know the __14__ of all the words in the __15__ and still be quite unable to __16__ English. We must also __17__ how to assemble __18__ into sentences and how to __19__ the sentences. Grammar is the __20__ knowledge that enables us to __21__ this.

A language is a very __22__ process for the production of __23__. As children, we usually __24__ how to produce sentences in our __25__ language without being __26__ of the fact that __27__ are learning to speak. At a very early __28__, we begin figuring out, from the __29__ speech that we hear, the __30__ of English grammar. We learn rules such as how to __31__ questions, how to request __32__, how to say no, how to __33__ plurals and past tenses, and __34__ to make certain ideas __35__ on others. When we say that a __36__ speaks English, we mean that he has __37__ into him a __38__ of rules which enable him to __39__ English sentences whenever he __40__ them. For example, the rules __41__ him to say exactly the __42__ he needs as an __43__ demands. He produces sentences that __44__ him to buy a __45__ of candy, to tell a __46__ how to get to __47__ and Main, to protest against not being __48__ to look at television, to __49__ a picnic, and to describe the __50__ of the Revolutionary War. The rules also enable him to understand the sentences of another person speaking the language.

When we talk to each other in our native language, we are not at all aware that we are using rules of grammar. We do not always know that we have used a subject, or a past tense, or a relative clause. Yet all the time we are working with rules of grammar. We acquire these rules for producing sentences simply by being born into the English-speaking community.

303 - 0

In order that a chemical reaction take place, there must be collisions between molecules. It is necessary that ___1___ and atoms come into ___2___ with each other so that an ___3___ can take place and ___4___ molecules be formed. The ___5___ the bits of ___6___ and the better they are ___7___, the more rapid and ___8___ the reaction will be. The ___9___ possible mixture would be ___10___ in which the molecules are ___11___ to move easily. This ___12___ exists when the reacting ___13___ are liquids and ___14___. Since most materials require a very ___15___ temperature to change them to ___16___, it is not convenient (and sometimes even impossible) to ___17___ with gas reactions in the ___18___.

Since gases are too ___19___ to work with, the next ___20___ condition for a chemical ___21___ to take place is between ___22___ of a liquid. Particles of ___23___ are free to move about and ___24___ with other particles. But what about ___25___ that we wish to ___26___ with each other in the ___27___? It is possible to ___28___ this freedom of movement in ___29___ of a solid by ___30___ the solid in water. ___31___ separates and frees the ___32___ of a solid so that they can ___33___ around and collide with ___34___ molecules. Whenever possible, therefore, the ___35___ uses a water solution of the ___36___ when he wishes to ___37___ about a chemical reaction. Furthermore, ___38___ are easy to handle and can be ___39___ very accurately without using a ___40___. As a general rule ___41___ temperatures are not necessary in order that ___42___ between solutions take place. This is ___43___ advantage of using solids in the ___44___ of solutions. This was why you ___45___ silver nitrate in water in your ___46___ experiment. It then reacted ___47___ with copper.

There is another ___48___ in using solutions. This is the ___49___ of making an indirect ___50___ of the mass of very small amounts of materials. Suppose a liter (1000 ml) of a solution of salt contains 1.0 g of salt. One milliliter of this solution (1.0 ml) will contain 1/1000 of the original amount of salt, or 0.001 g. If we know the mass of material dissolved in a certain volume of water we can calculate the mass of the material contained in a single drop of the solution.

500 - A

In order that a chemical reaction take place, there must be a collision between molecules. It is necessary that the (1) and atoms come in (2) with each other so as (3) can take place and (4) molecules can be formed. The reaction is more rapid and (5) if the bits of (6) are (7) and they are well (8). For (9) possible mixture is (10) in which the molecules are (11) to move easily. This (12) exists when liquids and (13) are the reacting (14). However, it is not easy (and sometimes even impossible) to (15) with gas reactions in the (16) since most materials require a very (17) temperature to change them into (18).

Since gases are too (19) to work with, the next (20) condition to get a chemical (21) is between (22) of a liquid. Molecules of a (23) are free to move about and (24) with other molecules. If we wish (25) to (26) with other solids in the (27), we can (28) this freedom of movement in the (29) of a solid by (30) the solid in water. (31) separates and frees the (32) of the solid so they can (33) around and collide with the (34) molecules. Whenever possible, therefore, the (35) uses a water solution of the (36) when he wishes to (37) about a chemical reaction. Furthermore, the (38) are easy to handle and can be (39) very accurately without using a (40). (41) advantage in using solids in the (42) of solutions is that (43) temperatures are not needed in order for the (44) between solutions to take place. This was why you (45) silver nitrate in water in your (46) experiment. It reacted (47) with copper.

Still another (48) in using solutions is that it is (49) to make an indirect (50) of the mass of a very small amount of material. For example, suppose a liter (1000 milliliters) of a salt solution has in it 1 gram of salt. One milliliter of this solution (1 ml) has 1/1000 of the original amount of salt, or 0.001 grams. If we know the mass of material dissolved in a certain volume of water we can figure out the mass of material that is in a single drop of the solution.

ANSWER SHEET

Form ____

PLEASE WRITE OR PRINT YOUR ANSWERS CLEARLY

1. _____
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48. _____
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50. _____

Student's Name: _____

ANSWER SHEET

FORM 100-0

PLEASE WRITE OR PRINT YOUR ANSWERS CLEARLY

1. building (constructing, making)
2. technicians
3. resources (materials)
4. work (plan, operation, project)
5. people (workers, workmen)
6. technological
7. workers (personnel, people laborers)
8. scientist
9. manager
10. money
11. Europe
12. student (person)
13. education (knowledge, studies, training)
14. homeland (country, home)
15. research (study, education)
16. gain (benefits)
17. brain
18. country (nation)
19. way
20. frightening (terrible hazardous)
21. held (kept)
22. centuries (ages)
23. new
24. takes
25. traditions (ideas)
26. people
27. worth
28. practical
29. African
30. New
31. Take
32. regions
33. chiefs
34. life
35. year
36. person
37. piece
38. improve
39. fill
40. erosion
41. plant
42. tend
43. nomadic
44. planting
45. grow
46. soil
47. Farmers
48. ownership
49. cycle
50. production

Student's Name: - Key -

(acceptable synonyms are in parentheses)

ANSWER SHEET

FORM 100 - R

PLEASE WRITE OR PRINT YOUR ANSWERS CLEARLY

1. building
2. technicians
3. resources
4. work
5. people
6. brain
7. scientist
8. manager
9. money
10. Europe
11. student
12. education
13. homeland
14. research
15. gain
16. countries
17. technological
18. workers
19. way
20. frightening
21. new
22. take
23. traditions
24. people
25. held
26. centuries
27. worth
28. practical
29. African
30. New
31. take
32. regions
33. chiefs
34. life
35. year
36. person
37. piece
38. improve
39. fill
40. erosion
41. plant
42. tend
43. nomadic
44. plant
45. grow
46. soil
47. farmers
48. ownership
49. cycle
50. production

Student's Name: -Key-

ANSWER SHEET

FORM 200 - O

PLEASE WRITE OR PRINT YOUR ANSWERS CLEARLY

1. Words
2. is
3. language
4. learning
5. mean
6. native
7. meaning
8. different
9. different
10. out
11. knowing
12. thing
13. most
14. meaning
15. dictionary
16. speak
17. know
18. words
19. pronounce
20. particular
21. do
22. complicated
23. sentences
24. learn
25. native
20. unconscious
27. we
28. age
29. random
30. rules
31. ask
32. things
33. make
34. how
35. depend
36. person
37. built
38. set
39. produce
40. needs
41. allow
42. occasion
43. sentences
44. permit
45. bar
46. stranger
47. Fifth
48. allowed
49. plan
50. causes

Student's Name: -Key-

ANSWER SHEET

FORM 200 - R

PLEASE WRITE OR PRINT YOUR ANSWERS CLEARLY

1. Words
2. is
3. language
4. learning
5. meanings
6. native
7. meaning
8. different
9. different
10. out
11. knowing
12. thing
13. most
14. meaning
15. dictionary
16. speak
17. know
18. words
19. say
20. particular
21. do
22. complicated
23. sentences
24. learn
25. native
26. aware
27. we
28. age
29. random
30. rules
31. ask
32. things; something
33. make
34. how
35. depend
36. person
37. built
38. set
39. produce
40. needs
41. allow
42. sentences
43. occasion
44. permit
45. bar
46. stranger
47. Fifth
48. allowed
49. plan
50. causes

Student's Name: - Key -

ANSWER SHEET

FORM 300-O

PLEASE WRITE OR PRINT YOUR ANSWERS CLEARLY

1. molecules
2. contact
3. exchange
4. new
5. smaller
6. material
7. mixed
8. complete
9. best
10. one
11. free
12. condition
13. substances
14. gases
15. high
16. gases
17. work
18. laboratory
19. difficult
20. best
21. reaction
22. particles
23. liquids
24. collide
25. solids
26. react
27. laboratory
28. attain
29. particles
30. dissolving
31. water
32. particles
33. more
34. other
35. chemist
36. solid
37. bring
38. solutions
39. measured
40. balance
41. high
42. reactions
43. another
44. form
45. dissolved
46. last
47. immediately
48. advantage
49. ease
50. measurement

Student's Name: -Key-

300-R

1. molecules
2. contact
3. exchange
4. new
5. complete
6. material
7. small
8. mixed
9. best
10. one
11. free
12. condition
13. gases
14. substances
15. work
16. laboratory
17. high
18. gases
19. difficult
20. best
21. reaction
22. molecules
23. liquid
24. collide
25. solids
26. react
27. laboratory
28. get
29. molecules
30. dissolving
31. Water
32. molecules
33. more
34. other
35. chemist
36. solid
37. bring
38. solutions
39. measured
40. balance
41. Another
42. form
43. high
44. reactions
45. dissolved
46. last
47. immediately
48. advantage
49. easy
50. measurement

Student's Name: -Key-

APPENDIX G

Sample Oral Recall Responses

FROM THE SOCIAL STUDIES PASSAGE

High Group

F115

About there are many jobs opening in New Africa. But many people are seeking other jobs in other countries. Therefore, New Africa should try, is trying to build up an industrial society so that not that many people are going over and building, and getting new jobs. Then they said about agriculture, agriculture, they should improve the methods. It said the chiefs are giving just land to the people on a one, year, one to one or year to year basis. And that they are not using, they're really gardening, not really using the agricultural techniques to take all that they can out from the soil. from the land to produce. And they said they should industrialize, industrialize more.

That they should build new factories so that not that many so that the economy will be higher. Then it said that in order to have agricultural progress, there must be industrial progress. Because in order to get the machinery and all that stuff, you should have people make that.

D030

It was about the African brain drain. How the technicians, skilled workers left Africa because there was no real kind of work for them. It was too poor so they went to England, America or some other continent, some other country to work. And that the nomadic peoples, they couldn't. They didn't own the land so what they did was, they exhausted the land and moved from one place to another. And if they would have owned it they would have sticked, stuck in one spot. As it were.

It said that the nomadic should be given titleship to land on a year to year basis.

There was one. Two to one. For every food, or something like that. It was a ratio. For every amount of food somebody produces in the country, two men, I'm not sure if it was one man or two men. will, in the city will get it; or something like that.

Average Group

D 031

African people, they find better jobs going to America. And that farming, farming. When farmers make crops, and all. It's better for them if they move on after one crop is done with. Cause the land, the soil gets all eroded and all.

The land has to be owned by the government.

B170

About scientists and technicians going into New Africa and trying to improve the land and stuff. How people are improving the land. That they have to give it out for life, that they were giving it for....they're giving it out to people for the rest of their lives. They want to do it for the rest of their life, but they go from a year to year basis.

That the technicians are trying to make more money in can make more money in Europe and America than to Africa.

Low Group

F074

About New Africa. What it was like. Why they're leaving. About education. Jobs.

(?) enough people to around in Africa. They don't have enough people to go around.

For education.

C126

About the agriculture in New Africa. And like in olden days the chief used to give out the land, sometimes for life, sometimes it was from a year to year basis.

There was, they had a way of solving the problem by getting more machinery for people to use, but the Africans mostly use their hands because it was tradition. Cause everybody, all their ancestors and everything just farm the land by themselves And have very few machinery.

FROM THE ENGLISH PASSAGE

High Group

F115

It was telling about that we may not know that we are using grammatical rules but we are. We learn from the time when we were born. But we don't know really. If you know all the words in a dictionary you can't. Oh I know but can't explain it. If someone knows every single word that might not have, know how to use it in the right tense, the right way.

It tells us that when we were little, we just, we don't learn The English language in a short amount of time. We learn it over the years. And we learn it by wanting to do things and from other people, other people, you know...Like when you're a little kid you learn from your parents. How to speak. You know, your mother says 'mama', so you say 'mama'.

D030

It was telling that a person can know the English language but wouldn't be able to speak it if he didn't know how to put it into correct sentences.

That people aren't aware when they're speaking that they're making grammatical errors or they, what a subject is, or preposition, or a noun, or verb. They just, it just comes naturally because they were born into the English language.

Average Group

D031

How we speak like when we're speaking regular English to a person, we don't use grammar, we don't think of what we're saying. Like we speak English, but we don't put the grammar into it. Like in a regular composition we think of all the grammar.

When you speak you don't think of all the grammar that has to be put into it.

Well when you are speaking you don't, like you wouldn't write, you'd write it down in a certain way. That's not the way you'd way it, out loud. Like you use different grammar when you are speaking than when you're writing.

C168

I told about the English language and the way you use it. And how it's important.

Like you need it to, to make, to communicate.

Low Group

F074

About English language. How to take a different language and know more about sentences.

How to speak a certain language you don't know. Know how to talk to somebody without mumbling.

C126

It was about the English language and how we learn.

Like when we were born, you have, you make sounds and you, like distinguish them from other things. Like when the baby says he wants water, he says 'wa-wa', something like that. Grown-ups can distinguish that because that sounds something like the word.

Like when we get older you learn about grammar and English. And how the language was developed.

Some people know all the words in a dictionary but they don't know all their mean, all the names, that's just a lot of words, but not everybody knows what they mean.

FROM THE SCIENCE PASSAGE

High Group

F115

What chemical reactions are best, no. Like liquids, solids or gases, which one of the, which one are better for chemical reactions.

Gases aren't. Liquids are. And solids in a similar liquid form are.

Are better suited for chemical reactions than gas.

Something about millimeters.

I remember the numbers but not what they are.

.001 millileters, grams or something like that.

B045

How the easiest way to dissolve chemicals in a solid, gases and liquids, and in solutions.

Well they had a...all it said was that it told about, it told about how many grams of a solid can be dissolved in water, in so much water. And which ways it was best to do in gas. WHICH IS THE BEST WAY? It says in gas, but that is hard because you need high temperature to change some materials into a state of gas.

DO THEY OFFER SOME SUGGESTION? I can't remember what it is. I think there was one.

That's all I can remember.

AVERAGE GROUP

D031

In a, if you want to get chemical, chemical, molecules to collide to form a chemical reaction, it's easier in a liquid than it is in a gas. And it's harder in a solid. But most easiest is a liquid. In a gas you have to heat it up, and it's very hard to heat it up. Sometimes you can't heat them all up. And in a liquid, the molecules are more freely, they're not together. And it's easy to bring them together if they're free.

It told about experiments. The numbers.

It had to do with salt.

E035

It was about chemical reactions and different solutions.

I just read it.

ANYTHING ABOUT THE CHEMICAL REACTIONS AND SOLUTIONS THAT YOU REMEMBER? Well, high temperatures aren't good, they said you use cool temperatures.

Low Group

F074

About an experiment.

How to make a sclutions.

About make some salt with water.

C126

About the molecules in gas and liquids and how molecules collide with others to form different substances.